

EAST INDIA (CHINCHONA PLANT).

No.	
24	Mr
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RETURN to an Address of the Honourable The House of Commons,
dated 14 May 1866;—for,

“ COPY of further CORRESPONDENCE relating to the Introduction of the
CHINCHONA PLANT into *India*, and to Proceedings connected with its
Cultivation, from April 1863 to April 1866.”

India Office,
June 1866. }

E. D. BOURDILLON,
Secretary in the Public Department.

(*Mr. Ewart.*)

Printed, by The House of Commons, to be Printed,
18 June 1866.

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COPY of further CORRESPONDENCE relating to the Introduction of the CHINCHONA PLANT into *India*, and to Proceedings connected with its Cultivation, from April 1863 to April 1866.

— I. —

CHINCHONA CULTIVATION ON THE NEILGHERRY HILLS.

— No. 1. —

From the Madras Government to the Secretary of State for India.

Madras, 11 April 1863.

WITH reference to your despatch, dated 16th January 1863, No. 2, we have the honour to advise you of the transmission by this Mail of specimens of Chinchona bark, &c., as per accompanying list, and to request that they may be submitted to Mr. Howard for analysis and report. Mr. McIvor's letter, dated 4th April 1863, copy of which is also transmitted, gives a full description of the several specimens.

Proceedings, dated
5 March 1863,
Nos. 55—58.
Proceedings, dated
11 April 1863,
No. 634.

Enclosure in No. 1.

From *W. G. McIvor*, Esq., Superintendent Government Chinchona Plantations, to *J. D. Sim*, Esq., Secretary to Government, Revenue Department, Fort Saint George.

Sir,

Ootacamund, 4 April 1863.

1. WITH reference to the Order of Government of the 5th March 1863, No. 471, and the Despatch from the Right Honourable Sir Charles Wood, dated 16th January 1863, No. 2, I have the honour to forward for transmission to Her Majesty's Secretary of State for India, specimens of Chinchona bark and wood, also dried leaves, decoction and infusion made from the same (as per list annexed), in order that they may be submitted to Mr. Howard for analysis and report. The specimens embrace the bark in all stages of growth from one month up to 15, and it is possible they may enable that eminent chemist to trace the earliest stage in which alkaloids begin to form, and thus throw much light upon the practical advantage or otherwise likely to be derived from our proposed system of lopping and pruning.

2. The barks were, in the first instance, dried upon warm iron plates; the process of drying being completed by exposure to the sun. During a portion of the time the barks were exposed to the sun, the atmosphere was very dry, indicating as much as 10° Fahr. between the wet and dry bulb thermometers.

3. The leaves in specimen No. 8 were dried in the sun under the same circumstances as the bark, while the leaves of specimen No. 9 were dried in the shade; and as they seem to have retained more of their virtue, it occurs to me that the bark should also have been dried in the shade, and I would respectfully solicit Mr. Howard's opinion on this point.

4. Specimens Nos. 10 and 11 of decoction and infusion made from the green leaves, immediately they were gathered from the plants, are submitted, as Mr. Howard from his great practical experience may be able to form a more correct opinion of their virtue than could be obtained in this country. At the same time we have submitted both decoction and infusion, as well as the leaves themselves, to the Principal Inspector

General Medical Department, Madras, as also to the senior medical officer of this station, for trial in the hospital here.

5. We have ascertained that the Chinchona tree has the power of rapidly renewing its bark, if the spaces from which it is taken are immediately covered with damp moss. Specimen No. 3 is the new bark formed over the same spaces from which the barks sent through Mr. Markham to Mr. Howard in July last were taken; this bark is consequently of eight months' growth, and is much thicker in proportion than bark of the same age formed on young wood. The object in submitting this small specimen of renewed bark is to ascertain whether bark so found is likely to prove of as much commercial value as that formed in the usual way; should it do so, it will prove of immense practical value, inasmuch as it will enable us to remove stripes of bark from the trunk, perhaps with the greatest advantage after a growth of from six to seven years, at the same time immediately covering the spaces with damp moss as the bark is removed; when treated in this manner, new bark will form over the entire surface in from six weeks to two months, when the moss may be taken off; the bark being then capable of performing all its functions without any protection whatever, and, perhaps, should be permitted to attain a growth of six or seven years before the same bark is again removed. Although it is possible, I do not see that any deterioration in the market value of the bark can be caused by this treatment, and should it prove successful it will have the immense advantage of enabling us to procure at least three times the produce of bark which could be had under any other system.

6. When the branch or stem of a Chinchona tree is covered with moss for a few months, the bark increases rapidly in thickness, and, consequently, in weight; the lower portion of specimen No. 4 illustrates the effect produced on the bark when treated in this manner. The object in submitting this specimen is to ascertain, if the increased thickness in the bark, and, consequently, the greater cellular development is likely to facilitate the deposit of alkaloids.

7. I fear that the specimens now sent may, perhaps, be too young to enable Mr. Howard to come to a definite conclusion, but I trust they may enable him to indicate the probable future results; and with the permission of Government, I will further prosecute the experiments above noticed, as I consider it desirable not to lose sight of the fact that we are only beginning the cultivation of a plant, the correct treatment of which is but little known. It is therefore important that we endeavour as early as possible to arrive at a system of cultivation which will produce the greatest yield of alkaloids and bark, with the least expenditure of time and capital.

No. 1. Specimens of bark from wood of the preceding year.

No. 2. Bark from wood of current growth.

No. 3. Specimen of bark formed over the spaces from which the bark had been removed in July 1862.

No. 4. Specimen of bark, the lower ends of which have been covered with moss since September 1862, until the date of being removed, 22d March 1863.

No. 5. Specimen of wood and bark of preceding year.

No. 6. Wood of preceding year.

No. 7. Wood and bark of current growth.

No. 8. Old leaves which had fallen spontaneously from the plants dried in the sun.

No. 9. Green leaves gathered from the plants and dried in the shade.

No. 10. Decoction of Chinchona leaves, boiled for half an hour, to which one-third of its bulk of brandy has been added to preserve it.

No. 11. Infusion of Chinchona leaves, to which also one-third of spirit has been added.

— No. 2. —

From the Government of Madras to the Secretary of State for India.

Madras, 13 April 1863.

We have the honour to forward for your information the accompanying Tabular Report on the number, condition, &c., of the Chinchona plants on the Neilgherries on the 31st March 1863.

OF THE CHINCHONA PLANT INTO INDIA.

3

Enclosure in No. 2.

From *W. G. McIvor*, Esq., Superintendent Government Chinchona Plantations, to *J. D. Sim*, Esq., Secretary to Government, Revenue Department.

Sir,

Ootacamund, 10 April 1863.

1. WITH reference to the Order of Government of the 22d October 1862, No. 2263, I have the honour to enclose the report for last month of our progress in the Chinchona operations.

2. As an alteration in the nomenclature of the species has been made at the suggestion of Mr. Clements R. Markham, with the concurrence and approval of Sir William and Dr. Hooker, I would respectfully solicit the favour of being furnished with six printed copies of the accompanying report for distribution.

REPORT on the Number, Distribution, and Condition of Chinchona Plants on the Neilgherries, on 31 March 1863.

No. of Species.	Botanical Names.	Commercial Names.	Number of Plants.	Value per Lb. of Dry Bark in the London Market.		REMARKS.
				s. d.	s. d.	
1	<i>C. succirubra</i> - -	Red Bark - -	51,648	2 6	to 8 9	The weather being favourable, the first planting operations of this season was commenced towards the end of the month. The number of plants planted being 750; thus making the total number of plants permanently placed out in the plantations 35,750. The growing season having fairly set in, these plants are making rapid growth. The increase by propagation during last month is 10,809, or about 1,500 under the average of the last six months.
2	<i>C. Calisaya</i> - -	Yellow Bark - -	1,540	2 10	to 7 -	
3	<i>C. officinalis</i> , var. <i>Condaminea</i> (<i>C. Uritusinga</i> Howard).	Original Loxa Bark	969	2 10	to 7 -	
4	<i>C. officinalis</i> , var. <i>Bonplandiana</i> (<i>C. Chahuarguera</i>).	Select Crown Bark -	68,757	2 10	to 7 -	
5	<i>C. crespilla</i> - -	Fine Crown Bark -	903	2 10	to 6 -	
6	<i>C. lancifolia</i> - -	Pitayo Bark - -	1	1 8	to 2 10	
7	<i>C. nitida</i> - -	Genuine Grey Bark	8,326	1 8	to 2 9	
8	<i>C. Species</i> without name.	Fine Grey Bark -	2,623	1 8	to 2 10	
9	<i>C. micrantha</i> - -	Grey Bark - -	8,424	1 8	to 2 9	
10	<i>C. Peruviana</i> - -	Finest Grey Bark -	2,937	1 8	to 2 10	
11	<i>C. Pahudiana</i> - -	Unknown - -	425	Worthless.		
TOTAL Number of Plants - - -			146,548			

TABLE II.

MEMORANDUM of the Growth of Eleven Plants of *C. succirubra*, planted in the Second Denison Plantation, at *Neddivuttum*, on 30 August 1862.

Number of Plants.	Height in Inches when Planted, 30 August 1862.	Height in Inches on 28 February 1863.	Height in Inches on 31 March 1863.	Growth in Inches during March 1863.	By Whom Planted.
1	23	48	53	5	His Excellency Sir W. Denison.
2	16½	44	48	4	
3	19	41	46	5	
4	15	43	47	4	
5	27	54	58	4	
6	20	43½	46	2½	J. W. Breeks, Esq. Dr. Sanderson. J. D. Sim, Esq. Lieutenant McLeod. P. Grant, Esq.
7	20	44½	48	3½	
8	18	44	46	4	
9	20	42	49	7	
10	20	51	56	5	
11	18	52	55	3	

TABLE II. exhibits the growth of 11 plants planted out by his Excellency the Governor and other gentlemen, on the 30th August 1862. The average growth of these plants during last month being 4¼ inches, or 1½ inch greater than the growth in February.

TABLE III.
MEMORANDUM of Chinchona Plants Distributed.

NAMES.	STATION.	Number of Plants.	REMARKS.
Mr. F. N. Maltby - - -	Travancore - - -	16	TABLE III. shows the number of plants sold or otherwise disposed of, and the localities to which they have been sent; while
Dr. Junghuhn - - -	Java - - -	56	
Mr. A. R. Lascelles - - -	Ootacamund - - -	12	
Mr. M. Anderson - - -	Jamaica - - -	2	
Dr. Wiebe - - -	Bombay - - -	10	
Dr. T. Anderson - - -	Calcutta - - -	554	
Dr. Jamieson - - -	Saharanpore - - -	107	
Professor Lees - - -	Calcutta - - -	61	
Rajah of Travancore - - -	Travancore - - -	521	
Major Morgan - - -	Ootacamund - - -	19	
E. T. Fitzgerald - - -	Calcutta - - -	261	
	TOTAL - - -	1,619	

TABLE IV.
REGISTER of Applications for Chinchona Plants in 1863-64.

NAMES.	STATION.	Number of Plants.
Mr. G. Dawson - - -	Ootacamund - - -	1,000
Mr. J. Chesson - - -	Mahableshtar - - -	500
Mr. W. Chambers - - -	Ootacamund - - -	1,000
Mr. A. R. Lascelles - - -	ditto - - -	10,000
Mr. T. De Facien - - -	Katarey - - -	5,000
Mr. G. Vincent - - -	ditto - - -	5,000
Mr. J. Pierie - - -	Calicut - - -	2,000
Mr. E. B. Thomas - - -	England - - -	500
Mr. G. Stainbank - - -	Katarey - - -	1,000
Mr. J. H. Schnarrie - - -	Ootacamund - - -	5,000
Mr. G. Southy - - -	Walghat - - -	1,700
Major Morgan - - -	Ootacamund - - -	1,000
Captain R. N. Taylor and Heads of Families at Coorg - - -	Coorg - - -	5,000
Superintendent of Astragam - - -	Mysore - - -	5,000
Mr. J. Knopp - - -	Ootacamund - - -	100
Mr. T. Rayne - - -	Manantoddy - - -	—
Captain T. H. Godfrey - - -	Ootacamund - - -	100
Mr. P. Grant - - -	Coimbatore - - -	100
	TOTAL - - -	44,000

TABLE IV. exhibits the register of applicants for Chinchona plants, for public companies and private cultivation.

The number of plants already bespoken amounts to 44,000; and when it is remembered that no public advertisement has been made of the intention of the Government to dispose of the plants, this fact clearly establishes that Chinchona cultivation will be extensively taken up by private enterprise. At the suggestion of Mr. C. R. Markham, the names of some of our species have been altered in this report; that gentleman's Memorandum on the subject is hereto attached, for the information of all who are interested in the nomenclature of the species.

Government Gardens, Ootacamund,
10 April 1863.

(signed) *W. G. McIvor*,
Superintendent, Government Chinchona Plantations.

MEMORANDUM.

There has been much confusion in the nomenclature of the species of Chinchona from the forests of Loja, three varieties of which are now growing on the Neilgherry Hills. They are all classed by Dr. Weddell under the head of *C. Condaminea*; and hitherto the varieties have been called in Mr. McIvor's Reports, 1. *Uritusinga*; 2. *Chahuarguera*; 3. *Crispa*.

Dr. Hooker, in a recent number of the "Botanical Magazine," has named the species *C. officinalis*, reverting to the original name given by Linnæus (see page 9 of "Travels in Peru and India"). Dr. Hooker says, "When once the law of priority is departed from without perfectly good cause, the door is opened to endless future change and consequent confusion. The genus was founded upon the one plant called 'squinina' by La Condamine, to which Linnæus gave the specific name of *C. officinalis*. This name, which appears to us in every way unobjectionable, and which was adopted by Vahl and Lambert, Willdenow, Lamarck, and Ræmer and Schultes, was changed by Humboldt and Bonpland to *C. Condaminea*, on grounds which we consider insufficient."

It is, therefore, proposed that the name *C. officinalis* should be adopted for this species now thriving in India, out of deference to the opinion of so high an authority on systematic botany as Dr. Hooker.

With regard to the three varieties of this species now growing on the Neilgherry Hills, it is proposed to adopt the following names, with the concurrence of Sir William and Dr. Hooker:—

(1.) That now called *Uritusinga* was the original variety discovered by La Condamine, and should therefore bear his name, Var. *Condaminea*.

(2.) That now called *Chahuarguera* is the identical plant figured in Plate X. of the great work of Humboldt and Bonpland (the unshaded branch with capsules). It ought, therefore, to bear the name of one or other of those eminent naturalists. A species of chinchona has already been called after Humboldt, and it is therefore proposed to call this variety *Bonplandiana*.

(3.) The variety called *Crispa* by Tafalla requires no alteration.

We thus have *C. officinalis*, 1. Var. *Condaminea*.

2. Var. *Bonplandiana*.

3. Var. *crispa*.

18 February 1863.

(signed) *Clements R. Markham*.

— No. 3. —

From the Government of Madras to the Secretary of State for India.

Madras, 13 May 1863.

We have the honour to forward, for your information, the accompanying Tabular Report on the number, condition, &c. of the Chinchona plants on the Neilgherries on the 30th April 1863.

Enclosure in No. 3.

From *W. G. McIvor*, Esq., Superintendent Government Chinchona Plantations, to
J. D. Sim, Esq., Secretary to Government, Revenue Department.

Sir,

Ootacamund, 9 May 1863.

WITH reference to the Order of Government of the 22d October 1862, No. 2263, I have the honour to enclose the Report for last month of our progress in the Chinchona operations.

REPORT on the Number, Distribution, and Condition of Chinchona Plants on the Neilgherries, on
30 April 1863.

No. of Species.	Botanical Names.	Commercial Names.	Number of Plants.	Value per Lb. of Dry Bark in the London Market.		REMARKS.
				s. d.	s. d.	
1	<i>C. succirubra</i> - -	Red Bark - - -	53,854	2 6	to 8 9	The number of plants planted out during last month being 5,647, making a total of 41,397, permanently planted out in the plantations. The increase by propagation during the month is 12,565, which is over the average results of the last six months.
2	<i>C. Calisaya</i> - -	Yellow Bark - - -	1,587	2 10	to 7 -	
3	<i>C. officinalis</i> , var. <i>Condaminea</i> (<i>C. Uritusinga</i> Howard).	Original Loxa Bark	1,051	2 10	to 7 -	
4	<i>C. officinalis</i> , var. <i>Bonplandiana</i> (<i>C. Chauarguera</i>).	Select Crown Bark -	77,322	2 10	to 7 -	
5	<i>C. crespilla</i> - -	Fine Crown Bark - -	1,003	2 10	to 6 -	
6	<i>C. lancifolia</i> - -	Pitayo Bark - - -	1	1 8	to 2 10	
7	<i>C. nitida</i> - - -	Genuine Grey Bark -	8,345	1 8	to 2 9	
8	<i>C. Species</i> without name.	Fine Grey Bark - -	2,638	1 8	to 2 10	
9	<i>C. micrantha</i> - -	Grey Bark - - -	8,517	1 8	to 2 9	
10	<i>C. Peruviana</i> - -	Finest Grey Bark -	2,961	1 8	to 2 10	
11	<i>C. Pahudiana</i> - -	Unknown - - -	425	Worthless.		
TOTAL Number of Plants - - -			157,704			

TABLE II.

MEMORANDUM of the Growth of 11 Plants of *C. succirubra*, Planted on the Second Denison Plantation, at *Neddivuttum*, on 30 August 1862.

Number of Plants.	Height in Inches when Planted, 30 August 1862.	Height in Inches on 31 March 1863.	Height in Inches on 30 April 1863.	Growth in Inches during April 1863.	By Whom Planted.
1	23	53	60	7	His Excellency Sir W. Denison.
2	16½	48	55	7	
3	19	46	51	5	
4	15	47	53	6	J. W. Breeks, Esq. Dr. Sanderson. J. D. Sim, Esq. Lieutenant McLeod. P. Grant, Esq.
5	27	58	64	6	
6	20	46	51	5	
7	20	48	53	5	
8	18	48	54	6	
9	20	49	54	5	
10	20	56	64	8	
11	18	55	60	5	

Table II. exhibits the growth of 11 plants planted out by His Excellency the Governor and other gentlemen on the 30th August 1862. The average growth of these plants during the month being 5½ths of an inch, or nearly 1½ inches greater than the growth in March.

TABLE III.

MEMORANDUM of the Height of 60 Plants, Planted below the Nursery on the Second Denison Plantation, on 18 September 1862, Average Height of the Plants at the time of Planting being 12 Inches.

No.	Ins.	No.	Ins.	No.	Ins.	No.	Ins.	No.	Ins.
1	54	13	52	25	36	37	49	49	48
2	51	14	51	26	40	38	54	50	40
3	43	15	50	27	50	39	53	51	44
4	54	16	51	28	54	40	43	52	48
5	50	17	48	29	48	41	50	53	43
6	50	18	50	30	54	42	48	54	44
7	48	19	52	31	46	43	48	55	45
8	48	20	58	32	54	44	48	56	48
9	44	21	52	33	54	45	48	57	48
10	52	22	51	34	53	46	48	58	55
11	50	23	50	35	60	47	55	59	45
12	50	24	48	36	51	48	51	60	50

REMARKS.

Table III. exhibits the growth of 60 plants measured without selection from one side of the plantation. This Table has been introduced in order to give a general idea of the growth of the plants as compared with the 11 selected plants given in the above Table. The growth of these 60 plants gives an average in 7 months and 12 days of 37 inches, while the 11 selected plants only gives an average growth in the same period of 30½ inches. The height of the largest plant on the 30th was 7 feet 6 inches, with branches from 3 to 5½ feet in length, the circumference of the stem being 6½ inches, measured at half a foot above the surface of the ground.

The number of plants distributed to the public during the month is 1,009; the additional plants registered for distribution being 950.

TABLE IV.
MEMORANDUM of Chinchona Plants Distributed.

NAMES.	STATION.	Number of Plants.
Mr. F. N. Maltby	Travancore	16
Dr. Junghuhn	Java	56
Mr. A. R. Lascelles	Ootacamund	12
Mr. M. Anderson	Jamaica	2
Dr. Wiehe	Bombay	10
Dr. T. Anderson	Calcutta	554
Dr. Jamieson	Saharanpore	107
Professor Lees	Calcutta	61
Rajah of Travancore	Travancore	521
Major Morgan	Ootacamund	19
Mr. E. T. Fitzgerald	Calcutta	261
Mr. J. W. B. Money	ditto	581
Dr. W. Browne	ditto	420
Mr. Cox	Wainad	6
Mrs. Hollock	ditto	2
TOTAL		2,628

TABLE V.
REGISTER of Applications for Chinchona Plants in 1863-64.

NAMES.	STATION.	Number of Plants.
Mr. G. Dawson	Ootacamund	1,000
Mr. J. Cheeson	Mahableshtar	500
Mr. W. Chambers	Ootacamund	1,000
Mr. A. R. Lascelles	ditto	10,000
Mr. T. DeFacien	Katary	5,000
Mr. G. Vincent	ditto	5,000
Mr. J. Pierie	Calicut	2,000
Mr. E. B. Thomas	England	500
Mr. G. Stainbank	Katary	1,000
Mr. G. H. Schnarrie	Ootacamund	5,000
Mr. G. Southy	Walghat	1,700
Major Morgan	Ootacamund	1,000
Captain R. N. Taylor and heads of families at Coorg	Coorg	5,000
Superintendent of Astagram Division	Mysore	5,000
Mr. J. Knop	Ootacamund	100
Mr. W. T. Rayne	Manantoddy	—
Captain T. H. Godfrey	Ootacamund	100
Mr. P. Grant	Coimbatore	100
Dr. A. E. M. Ross	Honore	200
Major C. P. Taylor	Ootacamund	500
Colonel Faber	ditto	50
Mr. S. James	ditto	200
TOTAL		44,950

Government Gardens, Ootacamund,
9 May 1863.

(signed) W. G. McIvor,
Superintendent Government Chinchona Plantations.

— No. 4. —

From Sir *Charles Wood* to the Government of Madras.

India Office, London, 16 July 1863.

Para 1. I HAVE considered in Council your letters in the Revenue Department, dated December 19th, No. 90 of 1862, January 10th, No. 2, February 11th, No. 11, March 11th, No. 20, April 11th, No. 29, April 13th, No. 30, and May 13th, No. 43, of 1863, reporting the progress of Chinchona cultivation on the Neilgherry Hills; and observe, with much satisfaction, that the plants have continued to thrive and increase in numbers during the cold dry weather of the winter months. Much credit is due to Mr. M'Ivor for the zeal and ability with which he has conducted this experiment, and for the great success which has already been attained; and the correctness of the system of cultivation recommended by Mr. Markham, which has been so steadily persevered in by Mr. M'Ivor, is now placed beyond doubt by the results of Mr. Howard's analysis.

2. The specimens of Chinchona bark and leaves which were forwarded with your letter dated 11th April (No. 29) 1863, have been referred to Mr. Howard for analysis, and I now transmit 50 copies of his report. You will observe that the young bark grown in India has yielded as large a per-centage of quinine as is usually obtained from the mature bark of the same species received from South America; and this result, which is as satisfactory as it is unexpected, will, probably, have the effect of increasing the demand for plants in India.

3. Mr. M'Ivor's attention should now be directed to the best method of drying the bark, to the discovery of the most advantageous time for cutting it, and to the best conditions for increasing its thickness and its yield of alkaloids. With this view, further supplies of bark should be sent home from time to time, in order that cultivators in India may have the advantage of Mr. Howard's observations on these points; and careful meteorological observations should be kept in the Chinchona plantations. I have given directions for a supply of the necessary instruments to be forwarded to Mr. M'Ivor with as little delay as possible.

4. There seems to be every reason to expect that Chinchona cultivation will be very extensively undertaken by private enterprise in the various hill districts of India; and the valuable and interesting manual of instructions drawn up by Mr. M'Ivor, which you have caused to be published, is likely to be of great service to cultivators. Many applications have already been made for plants, and I have noted with special pleasure that the heads of native families in Coorg are among the applicants. Not the least advantage which will be derived from this important experiment is, that the use of quinine will be extended to the natives; and the discovery that the leaves, as well as the bark, yield febrifuge alkaloids, will bring the healing virtues of quinine within the reach of the poorest labourer.

5. I have received reliable information that there has recently been a great and general deterioration of the quality of Peruvian bark received from South America, and, while informing you of this fact, I feel it to be unnecessary to urge upon you the incalculable importance of the success of chinchona cultivation in India, not only to that country, but to the whole civilized world.

I have, &c.
(signed) *C. Wood.*

— No. 5. —

From the Government of Madras to the Secretary of State for India.

Madras, 16 June 1863.

WE have the honour to forward, for your information, the accompanying Tabular Report on the number, condition, &c. of the Chinchona plants on the Neilgherries, on the 31st May 1863.

Enclosure in No. 5.

From *W. G. McIvor*, Esq., Superintendent Government Chinchona Plantations, to
J. D. Sim, Esq., Secretary to Government, Revenue Department.

Sir, Ootacamund, 11 June 1863.
WITH reference to the Order of Government of the 22d October 1862, No. 2263,
I have the honour to enclose the Report for last month of our progress in the Chinchona
operations.

REPORT on the Number, Distribution, and Condition of Chinchona Plants on the Neilgherries, on
the 31 May 1863.

No. of Species.	Botanical Names.	Commercial Names.	Number of Plants.	Value per Lb. of Dry Bark in the London Market.		REMARKS.
				s. d.	s. d.	
1	<i>C. succirubra</i> - -	Red Bark - -	56,385	2 6	to 8 9	I am happy to be able to state that two of the largest of our Chinchona plants are producing flower spikes, and no doubt many more will shortly do the same; we may therefore anticipate an early supply of seeds. The number of plants planted out during the month is 1,631, making a total of 43,028 permanently planted out in the plantations; all of these are making satisfactory progress. The increase by propagation during the month is 9,632, being 1,188 under the average results of the last six months.
2	<i>C. Calisaya</i> - -	Yellow Bark - -	1,607	2 10	to 7 -	
3	<i>C. officinalis</i> , var. <i>Condaminea</i> (<i>C. Uritusinga</i> Howard.)	Original Loxa Bark	1,103	2 10	to 7 -	
4	<i>C. officinalis</i> , var. <i>Bonplandiana</i> (<i>C. Chahuarguera</i>).	Select Crown Bark -	84,050	2 10	to 7 -	
5	<i>C. crespilla</i> - -	Fine Crown Bark -	1,056	2 10	to 6 -	
6	<i>C. lancifolia</i> - -	Pitayo Bark - -	4	1 8	to 2 10	
7	<i>C. nitida</i> - -	Genuine Grey Bark	8,868	1 8	to 2 9	
8	<i>C. Species</i> without name.	Fine Grey Bark -	2,654	1 8	to 2 10	
9	<i>C. micrantha</i> - -	Grey Bark - -	8,584	1 8	to 2 9	
10	<i>C. Peruviana</i> - -	Finest Grey Bark -	2,989	1 8	to 2 10	
11	<i>C. Pahudiana</i> - -	Unknown - -	425	Worthless.		
TOTAL Number of Plants - - -			167,215			

TABLE II.

MEMORANDUM of the Growth of Eleven Plants of *C. succirubra*, planted on the Second Denison Plantation at Nedddivuttum, on 30 August 1862.

Number of Plants.	Height in Inches when Planted, 30 August 1862.	Height in Inches on 30 April 1863.	Height in Inches on 31 May 1863.	Growth in Inches during May 1863.	By whom Planted.
1	23	60	65	5	His Excellency Sir W. Denison.
2	16½	55	60	5	
3	19	51	58	7	
4	15	53	58	5	J. W. Brecks, Esq. Dr. Sanderson. J. D. Sim, Esq. Lieutenant McLeod. P. Grant, Esq.
5	27	64	71	7	
6	20	51	55	4	
7	20	58	60	7	
8	18	54	61	7	
9	20	54	58	4	
10	20	64	70	6	
11	18	60	65	5	

TABLE II. exhibits the growth of 11 plants planted out by his Excellency the Governor, and other gentlemen, on the 30th August 1862. The average growth of these plants during the month is 5 $\frac{1}{4}$ ths of an inch, or about $\frac{1}{4}$ ths of an inch less than the growth in April.

TABLE III.
MEMORANDUM of Plants distributed.

NAMES.	STATIONS.	Number of Plants.	REMARKS.
Mr. F. N. Maltby	Travancore	16	The number of plants distributed to the public during the month is 124; the additional plants registered for distribution being 16,300.
Dr. Junghuhn	Java	56	
Mr. A. R. Lascelles	Ootacamund	12	
Mr. M. Anderson	Jamaica	2	
Dr. Wiehe	Bombay	10	
Dr. T. Anderson	Calcutta	554	
Dr. Jamieson	Saharanpore	107	
Professor Lees	Calcutta	61	
Rajah of Travancore	Travancore	621	
Major Morgan	Ootacamund	19	
Mr. E. T. Fitzgerald	Calcutta	261	
Mr. J. W. Money	ditto	581	
Dr. W. Bourne	ditto	420	
Captain Cox	Wainad	6	
Mrs. Hollock	ditto	2	
Mr. T. Sheffield	Ootacamund	12	
Dr. F. Day	Cochin	100	
Mr. Brown	Tellicherry	12	
TOTAL		2,752	

TABLE IV.
REGISTER of Applications for Chinchona Plants in 1863-64.

NAMES.	STATIONS.	Number of Plants.
Mr. G. Dawson	Ootacamund	1,000
Mr. J. Chesson	Mahableshtar	500
Mr. W. Chambers	Ootacamund	1,000
Mr. A. R. Lascelles	ditto	10,000
Mr. T. De Facien	Kartairy	5,000
Mr. G. Vincent	ditto	5,000
Mr. J. Pierie	Calicut	2,000
Mr. E. B. Thomas	England	500
Mr. G. Stainbank	Kartiry	1,000
Mr. J. H. Schnarrie	Ootacamund	5,000
Mr. G. Southey	Walghat	1,700
Major Morgan	Ootacamund	1,000
Captain R. N. Taylor and heads of families at Coorg	Coorg	5,000
Superintendent Astagram Division	Mysore	5,000
Mr. J. Knop	Ootacamund	100
Mr. W. T. Rayne	Manantoddy	400
Captain T. H. Godfrey	Ootacamund	100
Mr. P. Grant	Coimbatore	100
Dr. A. E. Ross	Honore	200
Major C. P. Taylor	Ootacamund	500
Colonel Faber	ditto	50
Mr. S. James	ditto	200
Major Hodgson	ditto	200
Dr. F. Day	Cochin	5,000
Colonel S. P. Scott	Meyloor	5,000
Major C. M. Fitzgerald	Calcutta	1,000
Lieutenant C. J. Jennings	Ootacamund	2,000
Captain Cox	Wainad	200
Dr. Macnamara	Bengal	1,000
Mr. G. Hurst	Darjeeling	1,000
Mr. Hall	Mahableshtar	500
TOTAL		61,250

Government Gardens, Ootacamund,
11 June 1863.

(signed) *W. G. McIvor*,
Superintendent Government Chinchona Plantations.

OF THE CHINCHONA PLANT INTO INDIA.

11

— No. 6. —

From the Government of Madras to the Secretary of State for India.

Madras, 13 July 1863.

We have the honour to forward, for your information, the accompanying Tabular Report, on the number, condition, &c., of the chinchona plants on the Neilgherries, on the 30th June 1863.

Enclosure, in No 6.

From *W. G. McIvor*, Esq., Superintendent to Government Chinchona Plantations, to *J. D. Sim*, Esq., Secretary to Government, Revenue Department, Fort St. George.

Sir,

Ootacamund, 10 July 1863.

1. WITH reference to the Order of Government of the 22d October 1862, No. 2,263, I have the honour to enclose the report for last month of our progress in the chinchona operations, to which is appended further information with reference to the analysis of bark forwarded to the Secretary of State in April last.

2. I would respectfully solicit the favour of being furnished with copies of the monthly reports on the progress of chinchona cultivation at Darjeeling, as also in the North West Provinces, if such are furnished to Government.

REPORT on the Number, Distribution, and Condition of Chinchona Plants on the Neilgherries, on the 30 June 1863.

No. of Specimens	Botanical Names.	Commercial Names.	Number of Plants.	Value per Lb. of Dry Bark in the London Market.		REMARKS.
				s. d.	s. d.	
1	<i>C. succirubra</i> - -	Red Bark - -	60,365	2 6	to 8 9	<p>The panicles of the <i>Chinchona succirubra</i>, which has produced flowering branches, make satisfactory progress.</p> <p>The number of plants planted out during the month is 15,413, making a total of 58,441 permanently planted out in the plantations, all of which are in a very thriving condition.</p> <p>The increase by propagation, during the month, is 14,483, or 4,893 plants above the average of the last six months.</p>
2	<i>C. Calisaya</i> - -	Yellow Bark - -	1,571	2 10	to 7 -	
3	<i>C. officinalis</i> , var. <i>Condaminea</i> (<i>C. Uritusinga</i> Howard).	Original Loxa Bark	1,197	2 10	to 7 -	
4	<i>C. officinalis</i> , var. <i>Bonplandiana</i> (<i>C. Chauarguera</i>).	Select Crown Bark -	94,050	2 10	to 7 -	
5	<i>C. crespilla</i> - -	Fine Crown Bark - -	1,085	2 10	to 6 -	
6	<i>C. lancifolia</i> - -	Pitayo Bark - -	4	1 8	to 2 10	
7	<i>C. nitida</i> - -	Genuine Grey Bark	8,380	1 8	to 2 9	
8	<i>C. Species</i> without name.	Fine Grey Bark - -	2,661	1 8	to 2 10	
9	<i>C. micrantha</i> - -	Grey Bark - -	8,738	1 8	to 2 9	
10	<i>C. Peruviana</i> - -	Finest Grey Bark -	3,038	1 8	to 2 10	
11	<i>C. Pahudiana</i> - -	Unknown - -	425	Worthless.		
TOTAL Number of Plants - - -			181,534			

TABLE II.

MEMORANDUM of the Growth of Eleven Plants of *C. succirubra*, planted in the Second Denison Plantation, at Neddivuttum, on 30 August 1862.

Number of Plants.	Height in Inches when Planted, 30 August 1862.	Height in Inches on 31 May 1863.	Height in Inches on 30 June 1863.	Growth in Inches during June 1863.	By Whom Planted.
1	23	65	70	5	<p>His Excellency Sir W. Denison.</p> <p>J. W. Breeks, Esq.</p> <p>Dr. Sanderson.</p> <p>J. D. Sim, Esq.</p> <p>Lieutenant McLeod.</p> <p>P. Grant, Esq.</p>
2	16½	60	67	7	
3	19	58	64	6	
4	16	58	66	8	
5	27	71	78	7	
6	20	55	58	8	
7	20	60	66	6	
8	18	61	68	7	
9	20	58	66	8	
10	20	70	78	8	
11	18	65	68	3	

TABLE II. exhibits the growth of 11 plants planted by his Excellency the Governor, and gentlemen, on the 30th A 1862. The average growth these plants during the month 6½ inches, or about 1½ inch above the growth in May

TABLE III.
MEMORANDUM of Chinchona Plants distributed.

NAMES.	STATIONS.	Number of Plants.	REMARKS.
Mr. F. N. Maltby - - - -	Travancore - - - -	16	The number of plants distributed to the public during the month is 144.
Dr. Junghuhn - - - -	Java - - - -	56	
Mr. A. R. Lascelles - - - -	Ootacamund - - - -	12	
Mr. M. Anderson - - - -	Jamaica - - - -	2	
Dr. Wiehe - - - -	Bombay - - - -	10	
Dr. T. Anderson - - - -	Calcutta - - - -	554	
Dr. Jamieson - - - -	Saharanpore - - - -	107	
Professor Lees - - - -	Calcutta - - - -	61	
Rajah of Travancore - - - -	Travancore - - - -	521	
Major Morgan - - - -	Ootacamund - - - -	39	
Mr. E. T. Fitzgerald - - - -	Calcutta - - - -	261	
Mr. J. W. Money - - - -	ditto - - - -	581	
Dr. W. Bourne - - - -	ditto - - - -	420	
Captain Cox - - - -	Wainad - - - -	6	The additional plants registered for distribution being 5,000.
Mrs. Hollock - - - -	ditto - - - -	2	
Mr. T. Sheffield - - - -	Ootacamund - - - -	12	
Dr. F. Day - - - -	Cochin - - - -	100	
Mr. Brown - - - -	Tellicherry - - - -	12	
Mr. J. Hall - - - -	Ootacamund - - - -	144	
	TOTAL - - - -	2,916	

TABLE IV.
REGISTER of Applications for Chinchona Plants in 1863-64.

NAMES.	STATIONS.	Number of Plants.
Mr. G. Dawson - - - -	Ootacamund - - - -	1,000
Mr. J. Chesson - - - -	Mahableshtar - - - -	500
Mr. W. Chambers - - - -	Ootacamund - - - -	1,000
Mr. A. R. Lascelles - - - -	ditto - - - -	10,000
Mr. T. DeFacien - - - -	Kartaury - - - -	5,000
Mr. G. Vincent - - - -	ditto - - - -	5,000
Mr. J. Pierie - - - -	Calicut - - - -	2,000
Mr. E. B. Thomas - - - -	England - - - -	500
Mr. G. Stainbank - - - -	Kartaury - - - -	1,000
Mr. J. H. Schnarrie - - - -	Ootacamund - - - -	5,000
Mr. G. Southey - - - -	Walghat - - - -	1,700
Major Morgan - - - -	Ootacamund - - - -	1,000
Captain R. N. Taylor and heads of families at Coorg - - - -	Coorg - - - -	5,000
Superintendent Astagram Division - - - -	Mysore - - - -	5,000
Mr. J. Knop - - - -	Ootacamund - - - -	100
Mr. W. T. Rayne - - - -	Manantoddy - - - -	400
Captain T. H. Godfrey - - - -	Ootacamund - - - -	100
Mr. P. Grant - - - -	Coimbatore - - - -	100
Dr. A. E. Ross - - - -	Honore - - - -	200
Major C. P. Taylor - - - -	Ootacamund - - - -	600
Colonel Faber - - - -	ditto - - - -	50
Mr. S. James - - - -	ditto - - - -	200
Major Hodgson - - - -	ditto - - - -	200
Dr. F. Day - - - -	Cochin - - - -	5,000
Colonel S. P. Scott - - - -	Meyloor - - - -	5,000
Major C. H. Fitzgerald - - - -	Calcutta - - - -	1,000
Lieutenant C. J. Jennings - - - -	Ootacamund - - - -	2,000
Captain Cox - - - -	Wainad - - - -	200
Dr. Macnamara - - - -	Bengal - - - -	1,000
Mr. G. Hurst - - - -	Darjeeling - - - -	1,000
Mr. Hall - - - -	Mahableshtar - - - -	500
Rev. J. B. Sawyers - - - -	Vellore - - - -	1,000
Mr. W. Stanes - - - -	Coonoor - - - -	3,000
Mr. D. Boncot - - - -	Cachar - - - -	1,000
	TOTAL - - - -	66,250

Government Gardens, Ootacamund,
11 June 1863.

(signed) *W. G. McIvor*,
Superintendent Government Chinchona Plantations.

— No. 7. —

From the Government of Madras to the Secretary of State for India.

Madras, 12 August 1863.

1. WE have the honour to forward the accompanying letters from Mr. M'Ivor, Superintendent Chinchona Plantations, with our proceedings thereon, for your information.

2. With the first of these letters, Mr. M'Ivor submitted a report from Mr. Howard, stating that quinine had been obtained from the twigs, &c. sent home by us in April last. Mr. M'Ivor proposed in consequence that the system of planting should be altered, nearly double the number of trees being planted in the same area.

3. We gave Mr. M'Ivor discretionary power to adopt this plan, and seeing that by it the produce of each acre would be nearly double, while private parties were rapidly buying plants, we asked Mr. M'Ivor's opinion as to the expediency of limiting our operations.

4. Mr. M'Ivor's reply has satisfied us that it would not be advisable to reduce the extent of our annual planting, and we have, therefore, desired him to continue to plant 150 acres yearly.

5. We take this opportunity of bringing under your consideration the advantage of manufacturing quinine at Ootacamund from the bark there produced. Independent of our own plantations, there can be little doubt that the chinchona will be extensively grown by private individuals, now that it is proved that early returns may be expected on the outlay incurred. It would be good economy, therefore, to manufacture quinine on the spot, instead of, as at present, having to send the bark to England, and re-importing it as quinine. We would, therefore, suggest for your consideration, the establishment, as soon as our supply of bark is sufficient, of a Government manufactory, to which, when the requirements of Government permit, private individuals might also send their bark; and meanwhile we would recommend that the necessary inquiries be made on the subject.

Enclosure 1, in No. 7.

From *W. G. M'Ivor, Esq.*, Superintendent Government Chinchona Plantations, Ootacamund, to *J. D. Sim, Esq.*, Secretary to Government, Revenue Department, Fort Saint George.

Sir,

Ootacamund, 7 July 1863.

1. IT affords me much pleasure to be able to submit, for the information of Government, the enclosed report of the analysis of Chinchona bark, submitted to the Secretary of State by Order of Government, under date 11th April 1863, No. 634.

2. This highly satisfactory report of the early formation of alkaloids would seem to render necessary a change in our present system of cultivation. In order to obtain the greatest possible return, it is no doubt desirable that instead of our plants being planted ten feet apart as at present, the distance should be reduced to eight feet for the red and yellow barks, and six feet for the crown barks; this would enable us at the end of the fifth or sixth year to remove each alternate plant. This operation would give those remaining sufficient space to attain maturity, and yield a large harvest of bark; while the plants by being placed close together will afford each other in the early stages of growth protection from the parching rays of the sun during the dry season, and also from the gales of wind during the monsoon.

3. I would, therefore, propose, with the permission of Government, to follow the close system of planting in future, as it is of great importance to obtain as early a return as possible in a cultivation of this description. This alteration in the system of cultivation will nearly double the number of plants required per acre, and may in consequence for a short time reduce the number of plants available for the public.

Enclosure 2, in No. 7.

From *J. E. Howard, Esq.*, to *C. R. Markham, Esq.*

My dear Sir,

28 May 1863.

1. I HAVE great pleasure in informing you that the result of my examination of the bark of *C. succirubra*, grown in India, is very satisfactory. I have, thus far, only operated upon 500 gr., proceeding cautiously, as the quantity of bark sent is small. I find exactly the same constituents as in South American "red bark," and was able to obtain a first and second crystallisation of very white sulphate of quinine mixed (as is usual when obtained from "red bark") with sulphate of chinchonidine; I have also obtained some chinchonine.

2. This must be considered a very satisfactory and promising result, when the immature age of the bark is considered (viz., two years' growth), and especially when I add that the per centage product of alkaloid appears to me as great as would be met with in South America under the same circumstances.

3. I hope to be prepared shortly to give you more definite information on this point, as well as on others of moment connected with the investigations I am pursuing.

Enclosure 3, in No. 7.

From *W. G. McIvor, Esq.*, Superintendent Government Chinchona Plantations, Ootacamund, to *J. D. Sim, Esq.*, Secretary to Government, Revenue Department, Fort Saint George.

Sir,

Ootacamund, 27 July 1863.

1. IN obedience to the Order of Government of the 21st July 1863, No. 1351, I have the honour to report that I am unable to perceive any advantage likely to be derived by Government, or the community, by limiting the planting of chinchonas to 50 acres per annum instead of 150, especially at this moment, when we are in a position to urge forward our operations not only with a certainty of success, but with the certainty of conferring great public benefit, by shortly placing in the market a supply of a medicine unequalled in its curative properties, at a time when the supply from South America is greatly decreasing. Moreover, we have now gained experience and a knowledge of the cultivation of the plants, and, with this advantage, to hand over the greater number of our plants to the management of an inexperienced public, could not conduce to the progress of the cultivation, but the reverse.

2. The Government have already very liberally met the wishes of the public to a great extent, and at a considerable sacrifice to the progress of our chinchona cultivation. In compliance with the G. O. dated 16th April 1861, No. 855, fully one-half of the seeds we received were distributed to coffee planters and others, who wished to "try and rear them." Not a single plant was reared from these seeds; whereas had they been retained here the plants produced from them and increased by propagation would nearly have doubled our present stock.

3. In addition, upwards of 3,000 plants have already been distributed to the public, and nearly two-thirds of these have been lost; and we would not be justified in expecting a better result until the public acquire a knowledge of the treatment of the plants; this they will be some time in gaining, as there is a tendency to attribute each failure to the plants "being unhealthy," or to "something in the climate," instead of to the generally true cause, viz., a want of knowledge of their management. We have placed the public in possession of all the knowledge we have attained in this respect; yet they have the practice to learn, and before this is accomplished there will be many disappointments and failures. Applications have been registered for 100,000 plants, which I trust to be able to supply in 1864-65, and this number, with those already issued, is certainly sufficient to enable the public to gain experience, when it is considered that we commenced on the 9th May 1861 with only 1,128 plants.

4. The propagation of the plants has always received our greatest attention, being from the first pushed to the greatest extent practicable, but the multiplication of these plants by propagation entirely depends upon the increase of our stock of plants, as there is always a limit to the supply of wood from which to make cuttings, and each plant which is added to our stock consequently adds to the production of wood and to our means of propagation; while, on the contrary, the moment we begin to issue plants extensively to the public, our means of propagation are decreased, as the cuttings produced by the plants issued are lost to us; it is therefore impracticable to increase our propagation, and at the same time extensively distribute our plants to the public.

— No. 8. —

From the Government of Madras to the Secretary of State for India.

15 August 1863.

WE have the honour to forward for your information the accompanying Tabular Report on the Number, Condition, &c., of the Chinchona Plants on the Neilgherries on the 31st July 1863.

Enclosure in No. 8.

From *W. G. McIvor, Esq.*, Superintendent Government Chinchona Plantations, Ootacamund, to *J. D. Sim, Esq.*, Secretary to Government, Revenue Department, Fort St. George.

(No. 67.)

Sir,

Ootacamund, 11 August 1863.

WITH reference to the Order of Government of the 22d October 1862, No. 2263, I have the honour to enclose the report for last month of our progress in the Chinchona operations.

REPORT on the Number, Distribution, and Condition of Chinchona Plants on the Neilgherries, on the 31 March 1863.

Species.	Botanical Names.	Commercial Names.	Number of Plants.	Value per lb. of Dry Bark in the London Market.		REMARKS.
				s. d.	s. d.	
1	<i>C. succirubra</i> - -	Red Bark - -	65,216	2 6	to 8 9	The number of plants planted out during the month is 6,842, making a total of 64,783 permanently planted out in the plantations.
2	<i>C. Calisaya</i> - -	Yellow Bark - -	1,627	2 10	to 7 0	
3	<i>C. officinalis</i> , var. <i>Condaminea</i> (<i>C. Uritusinga</i> Howard).	Original Loza Bark	1,261	2 10	to 7 0	
4	<i>C. officinalis</i> , var. <i>Bonplandiana</i> (<i>C. Chahuarguera</i>).	Select Crown Bark -	104,871	2 10	to 7 0.	All the plants in the open ground are making very satisfactory progress, while the plants which are planted under the shade of living trees have suffered considerably from the drip, owing to the continuous rain.
5	<i>C. crespilla</i> - -	Fine Crown Bark	1,126	2 10	to 6 0	
6	<i>C. lancifolia</i> - -	Pitayo Bark -	4	1 8	to 2 10	
7	<i>C. nitida</i> - -	Genuine Grey Bark -	8,886	1 8	to 2 9	
8	<i>C. Species</i> without name.	Fine Grey Bark -	2,706	1 8	to 2 10	
9	<i>C. micrantha</i> - -	Grey Bark - -	8,956	1 8	to 2 9	The increase by propagation is 16,784 or 5,577 plants above the average of the last six months.
10	<i>C. Peruviana</i> - -	Finest Grey Bark -	3,062	1 8	to 2 10	
11	<i>C. Pahudiana</i> - -	Unknown - -	425	Worthless.		
TOTAL Number of Plants - - -			197,639			

TABLE II.

MEMORANDUM of the Growth of Eleven Plants of *C. succirubra*, planted in the Second Denison Plantation, at Neddivutum, on 30 August 1862.

Number of Plants.	Height in Inches when Planted, 30 August 1862.	Height in Inches on 30 June 1863.	Height in Inches on 31 July 1863.	Growth in Inches during July 1863.	By Whom Planted.
1	28	70	77	7	His Excellency Sir W. Denison.
2	16½	67	72	5	
3	19	64	67	3	
4	15	60	71	5	
5	27	78	82	4	
6	20	58	61	3	J. W. Brecks, Esq. Dr. Sanderson. J. D. Sim, Esq. Lieutenant McLeod. P. Grant, Esq.
7	20	66	69	3	
8	18	68	71	3	
9	20	66	70	4	
10	20	78	81	3	
11	18	68	73	5	

TABLE II. exhibits the growth of eleven plants planted out by His Excellency the Governor and the other gentlemen on the 30th August 1862; the average growth of these plants during the month is 4½ inches.

TABLE III.

MEMORANDUM of Chinchona Plants distributed.

NAMES.	STATIONS.	Number of Plants.	REMARKS.
Mr. F. N. Maltby - - - -	Travancore - - - -	16	The number of plants issued is 679, making the total number distributed 3,595; the additional plants registered for distribution during the month is 33,750, which completes the register for 1864-65, consequently no further applications can be entertained at present.
Dr. Junghuhn - - - -	Java - - - -	56	
Mr. A. R. Lascelles - - - -	Ootacamund - - - -	12	
Mr. M. Anderson - - - -	Jamaica - - - -	2	
Dr. Wiehe - - - -	Bombay - - - -	10	
Dr. T. Anderson - - - -	Calcutta - - - -	554	
Dr. Jamieson - - - -	Saharanpore - - - -	107	
Professor Lees - - - -	Calcutta - - - -	61	
Rajah of - - - -	Travancore - - - -	521	
Major Morgan - - - -	Ootacamund - - - -	116	
Mr. F. T. Fitzgerald - - - -	Calcutta - - - -	261	
Mr. J. W. Money - - - -	- ditto - - - -	581	
Dr. W. Bourne - - - -	- ditto - - - -	420	
Captain Cox - - - -	Wainad - - - -	6	
Mrs. Hollock - - - -	- ditto - - - -	2	
Mr. T. Sheffield - - - -	Ootacamund - - - -	12	
Mr. F. Day - - - -	Cochin - - - -	100	
Mr. Brown - - - -	Tellicherry - - - -	12	
M. J. Hall - - - -	Ootacamund - - - -	144	
Mr. J. Knop - - - -	- ditto - - - -	18	
Captain Lees - - - -	Bengal - - - -	281	
Mr. W. H. Rayne - - - -	Manantoddy - - - -	24	
Reverend Sayer - - - -	Ootacamund - - - -	12	
M. Friend - - - -	- ditto - - - -	12	
M. J. Pierie - - - -	Calicut - - - -	12	
Colonel Scott - - - -	Ootacamund - - - -	195	
M. J. Hunter - - - -	Coonoor - - - -	12	
Colonel R. Cooper - - - -	Kotergherry - - - -	12	
Colonel Woodfall - - - -	Coonoor - - - -	12	
Colonel Angelo - - - -	Ootacamund - - - -	12	
Total number of Plants - - - -		3,595	

TABLE IV.

Register of Applications for Chinchona Plants in 1863-64.

NAMES.	STATIONS.	Number of Plants.
Mr. G. Dawson - - - -	Ootacamund - - - -	1,000
" J. Chesson - - - -	Mahableshwar - - - -	500
" W. Chambers - - - -	Ootacamund - - - -	1,000
" A. R. Lascelles - - - -	- ditto - - - -	10,000
" T. De Facian - - - -	Kartaury - - - -	5,000
" G. Vincent - - - -	- ditto - - - -	5,000
" J. Pierie - - - -	Calicut - - - -	2,000
" E. B. Thomas - - - -	England - - - -	500
" G. Stainbank - - - -	Kartaury - - - -	1,000
" J. H. Schnarrie - - - -	Ootacamund - - - -	5,000
" G. Southey - - - -	Walghat - - - -	1,700
Major Morgan - - - -	Ootacamund - - - -	1,000
Captain R. N. Taylor and heads of families at - - - -	Coorg - - - -	5,000
Superintendent of Astagram Division - - - -	Mysore - - - -	5,000
Mr. J. Knop - - - -	Ootacamund - - - -	100
" W. T. Rayne - - - -	Manantoddy - - - -	400
Captain T. H. Godfrey - - - -	Ootacamund - - - -	100
Mr. P. Grant - - - -	Coimbatore - - - -	100
Dr. A. E. Ross - - - -	Honore - - - -	200
Major C. P. Taylor - - - -	Ootacamund - - - -	500
Colonel Faber - - - -	- ditto - - - -	50
Mr. S. James - - - -	- ditto - - - -	200
Major Hodgson - - - -	- ditto - - - -	200
Dr. F. Day - - - -	Cochin - - - -	5,000

TABLE IV.—Register of Applications for Chinchona Plants in 1863-64—continued.

NAMES.	STATIONS.	Number of Plants.	REMARKS.
Colonel S. P. Scott	Meyloor	5,000	
Major C. H. Fitzgerald	Calcutta	1,000	
Lieutenant C. J. Jennings	Ootacamund	2,000	
Captain Cox	Wainad	200	
Dr. Macnamara	Bengal	1,000	
Mr. G. Hurst	Darjeeling	1,000	
Mr. Hall	Mahableswar	500	
Rev. J. B. Sawyers	Vellore	1,000	
Mr. W. Stanes	Coonoor	3,000	
Mr. D. Boncot	Cachar	1,000	
Major Hutton	Ootacamund	5,000	
Dooroojee Row & Co.	ditto	2,000	
Mr. Jones	ditto	1,000	
Mr. Nicholus	ditto	1,000	
Mr. C. Sanderson	Coonoor	4,000	
Mr. J. Herklots	ditto	10,000	
Dr. J. Rogers	Ootacamund	8,000	
Major Agnew	Assam	200	
Mr. E. T. Fitzgerald	London	200	
Mr. G. D. Lyon	Kot Kongra	50	
Mr. Graemes	Ootacamund	2,800	
TOTAL Number of Plants		1,00,000	

Ootacamund,
11 August 1863.

(signed) *W. G. McIvor*,
Superintendent Government Chinchona Plantations.

— No. 9. —

From the Government of Madras to the Secretary of State for India.

12 September 1863.

1. Mr. McIvor, the Superintendent of the Government Chinchona Plantations on the Neilgherries, has applied to us for an increase of salary.

2. You are aware that he now draws 400 rupees per mensem for the united charge of the Chinchona Plantations and the Botanical Gardens at Ootacamund. After the Chinchona experiment had been some time in progress we considered that the additional trouble and responsibility imposed upon him should be remunerated by an increased allowance, and we therefore proposed * to raise his pay from 200 rupees to 300 rupees per mensem. This received † your sanction. Subsequently, however, we resolved to recommend that he should receive 350 rupees, to be raised to 400 rupees per mensem in the second year, and this measure also met ‡ with your cordial approbation.

3. Mr. McIvor now seeks to be placed on a footing equal to that of Dr. Junghuhn, the Superintendent in charge of Chinchona Plantations in Java, to whom a salary is allowed by the Netherlands Government equivalent to 1,250 l. per annum.

4. You will observe that Mr. McIvor grounds his request on the alleged fact that the Chinchona cultivation has passed the condition of an experiment and become an established success; while the results which he enumerates in the 3d paragraph of his letter, § as already accomplished, or about to be realized, and for which he seeks commensurate remuneration, have, in his opinion, been reached only by the exercise of an amount of resource, skill, and unwearied exertion on his own part which he is confident we shall not under-estimate.

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5. In

* To England, 6 July 1861, No. 89.
† 14 September 1861, No. 46.
‡ To England, 23d October 1862, No. 75, paragraph 11.
From England, 16 January 1863, No. 2, paragraph 7.
Vide Mr. Consul General Fraser's Report, forwarded with Despatch, dated 15 February 1862, No. 6.
§ Dated 18th August 1863, No. 73.
Proceedings of Government, 12 September 1863, No. 1687.

5. In our opinion Mr. McIvor's application is premature and unreasonable. We appreciate and have acknowledged the zeal and ability with which he has conducted the experiment by doubling his allowances; but we consider that he over-rates the importance of his services, and we are not prepared to place him in the position of the head of a scientific establishment.

6. We consider, however, that he may fairly, as the Chinchona operations extend, expect an increase of salary, and we therefore propose to allow him to draw at the rate of 500 rupees per mensem from January 1864.

Enclosure in No. 9.

From *W. G. McIvor*, Esq., Superintendent Government Chinchona Plantations, Ootacamund, to *J. D. Sim*, Esq., Secretary to Government, Revenue Department, Fort St. George, No. 73.

Sir,

Ootacamund, 13 August 1863.

1. Now that the Chinchona cultivation has passed the condition of an experiment, and become an established success, I would most respectfully solicit the favour of Government being pleased to take into favourable consideration the services I have performed, and grant me a remuneration commensurate with the results I have produced, and with the responsibility and anxiety attached to conducting so important an undertaking as the cultivation of the Quinine-yielding Chinchonas in Southern India.

2. I would observe that in the early part of this important undertaking I was perfectly willing to superintend the operations for the additional salary granted me in Government Order dated 7th September 1861, No. 1786, viz., 150 rupees per mensem for the first year, and 200 rupees per mensem for the second year; as from my observations of the nature of the plants, I at that time perceived that their introduction and cultivation could be successfully accomplished under proper management, therefore my chief object was to attain this, and to secure to the productive resources of India the important addition of Peruvian bark, while we established the means of ultimately placing within the reach of the poorer classes of the native community, in the shortest possible space of time, a remedy unequalled in its curative effects on the prevailing fevers of this country.

3. Not only have we attained an unequalled success in the management and treatment of these valuable plants, but we have, by the introduction of an entirely new system of cultivation, placed Chinchona in its early productiveness equal, if not in advance of tea and coffee, and thus accomplished a result, the importance of which cannot at present be fairly appreciated; some idea, however, may be formed of its ultimate benefit, when previously Chinchona was considered to be only productive after 40 or 50 years' growth. These results, however simple they may appear now that they are obtained, have only been accomplished by the exercise of an amount of resource, skill, and unwearied exertion on my part, which I am confident the Government will not under-estimate.

4. I most respectfully bring to the notice of the Government that the salary of Junghun, the Superintendent of Chinchona cultivation in Java, is 1,250*L.* per annum, with other perquisites, as per despatch from the Secretary of State forwarded for my information with the Government Order dated 24th October 1862, No. 2272, while the results obtained in Java, when viewed in connection with what we have accomplished, are comparatively insignificant. I am therefore confident that your Honourable Government will not hesitate to place me in a position equal to that in which the Dutch Government have placed Dr. Junghun.

Order of the Madras Government, 12th September 1863.

The Government are unable to accede to Mr. McIvor's proposal, but they will recommend to the Secretary of State that he be allowed to draw pay at the rate of 500 rupees per mensem from 1st January 1864.

— No. 10. —

From the Government of Madras to the Secretary of State for India.

Madras, 26 September 1863.

WE have the honour to forward for your information the accompanying Tabular Report on the number, condition, &c., of the Chinchona plants on the Neilgherries on the 31st August 1863.

OF THE CHINCHONA PLANT INTO INDIA.

19

Enclosure in No. 10.

From *W. G. McIvor*, Esq., Superintendent, Government Chinchona Plantations, Ootacamund, to *J. D. Sim*, Esq., Secretary to Government, Revenue Department, Fort St. George.

Sir,

Ootacamund, 8 September 1863.

WITH reference to the Order of Government, dated 22 October 1862, No. 2263, I have the honour to enclose the report for last month of our progress in the Chinchona operations.

REPORT on the Number, Distribution, and Condition of Chinchona Plants on the Neilgherries, on the 31st August 1863.

No. of Species.	Botanical Names.	Commercial Names.	Number of Plants.	Value per lb. of Dry Bark in the London Market.		REMARKS.
				s. d.	s. d.	
1	<i>C. succirubra</i> - -	Red Bark - -	70,105	2 6	to 8 9	<p>The month being one of almost continuous rain, the earth was too wet for planting operations, and consequently only 1,172 plants were permanently planted out in the plantations, making a total of 65,955.</p> <p>A heavy storm on the night of the 12th and 13th almost destroyed 70 plants, and seriously broke or damaged portions of one hundred more; this happened on one of the ridges exposed to the west wind; the species which suffered most being the red bark. All the other plants continue to make rapid growth, and are in the finest state of health.</p> <p>Owing to the very wet weather, 23,856 plants intended for planting out permanently had to be transplanted into the nursery beds, where they will now remain until the first showers in March and April, as the season most favourable for permanently placing out the plants has already passed.</p> <p>The height of the largest plant at present is 9 feet 2 inches. The blossoms on the large plant in the conservatory are now fully expanded, and promise to mature its seeds, although the plant is only a little more than two years old.</p> <p>The increase by propagation is 20,977, or 3,680 plants above the average of the last six months.</p> <p>TABLE II. exhibits the growth of 11 plants planted out by his Excellency the Governor, and other gentlemen, on the 30th August 1862. The average growth of these plants during the month is 5 inches. The two plants cut down on the 20th of March last, for the bark submitted to Mr. Howard for analysis have made fine strong shoots from 9 to 10 inches in height.</p>
2	<i>C. Calisaya</i> - -	Yellow Bark - -	1,672	2 10	to 7 -	
3	<i>C. officinalis</i> , var. <i>Condaminea</i> (<i>C. Uritusinga</i>).	Original Loxa Bark -	1,345	2 10	to 7 -	
4	<i>C. officinalis</i> , var. <i>Bonplandiana</i> (<i>C. Chahuarguera</i>).	Select Crown Bark -	119,616	2 10	to 7 -	
5	<i>C. crespilla</i> - -	Fine Crown Bark -	1,192	2 10	to 6 -	
6	<i>C. lancifolia</i> - -	Pitayo Bark - -	6	1 8	to 2 10	
7	<i>C. nitida</i> - -	Genuine Grey Bark -	8,388	1 8	to 2 9	
8	<i>C. Species</i> without name.	Fine Grey Bark -	2,724	1 8	to 2 10	
9	<i>C. micrantha</i> - -	Grey Bark - -	9,322	1 8	to 2 9	
10	<i>C. Peruviana</i> - -	Finest Grey Bark -	3,071	1 8	to 2 10	
11	<i>C. Pahudiana</i> - -	Unknown - -	425	Worthless.		
TOTAL Number of Plants - - -			217,866			

TABLE II.

MEMORANDUM of the Growth of Eleven Plants of *C. succirubra*, planted on the Second Denison Plantation, at Neddivuttam, on 30 August 1862.

Number of Plants.	Height in Inches when Planted on 30 August 1862.	Height in Inches on 31 July 1863.	Height in Inches on 31 August 1863.	Growth in Inches during August 1863.	By whom Planted.
1	23	77	81	4	<p>His Excellency Sir W. Denison.</p> <p>J. W. Breeks, Esq. Dr. Sanderson. J. D. Sim, Esq. Lieutenant McLeod. P. Grant, Esq.</p> <p>Growth of the plants cut down for the bark sent to England.</p>
2	16½	72	76	4	
3	19	67	70	3	
4	15	71	77	6	
5	27	82	88	6	
6	20	61	66	5	
7	20	69	75	6	
8	18	71	76	6	
9	20	70	76	6	
10	20	81	86	6	
11	18	73	79	6	
12	0	0	9	0	
13	0	0	10	0	

TABLE III.

MEMORANDUM of Chinchona Plants distributed.

Names.	Stations.	Number of Plants.	REMARKS.
Mr. F. N. Maltby - - - -	Travancore - - - -	16	The number of plants issued to the public is 514, making the total number distributed 4,108.
Dr. Junghun - - - -	Java - - - -	56	
Mr. A. R. Lascelles - - - -	Ootacamund - - - -	12	
Mr. M. Anderson - - - -	Jamaica - - - -	2	
Dr. Wiehe - - - -	Bombay - - - -	10	
Dr. T. Anderson - - - -	Calcutta - - - -	554	
Dr. Jamieson - - - -	Saharanpore - - - -	107	
Professor Lees - - - -	Calcutta - - - -	61	
Rajah of - - - -	Travancore - - - -	521	
Major Morgan - - - -	Ootacamund - - - -	216	
Mr. E. F. Fitzgerald - - - -	Calcutta - - - -	261	
Mr. J. W. Money - - - -	Ditto - - - -	581	
Dr. W. Bourne - - - -	Ditto - - - -	420	
Captain Cox - - - -	Wainad - - - -	6	
Mr. Hollock - - - -	Ditto - - - -	2	
Mr. T. Sheffield - - - -	Ootacamund - - - -	12	
Mr. F. Day - - - -	Cochin - - - -	100	
Mr. Brown - - - -	Tellicherry - - - -	12	
Mr. J. Hall - - - -	Ootacamund - - - -	144	
Mr. J. Knop - - - -	Ditto - - - -	18	
Captain Lees - - - -	Bengal - - - -	281	
Mr. W. H. Rayne - - - -	Manantoddy - - - -	24	
Reverend — Sayer - - - -	Ootacamund - - - -	12	
Mr. Friend, Mr. Hallock - - - -	Ditto - - - -	18	
Mr. J. Pierie - - - -	Calicut - - - -	12	
Colonel Scott, Mr. F. Berend - - - -	Ootacamund - - - -	470	
Rev. J. Hunter, Mr. J. Mullaly - - - -	Coonoor - - - -	24	
Col. R. Cooper, Mr. F. Cockburn - - - -	Kotagherry - - - -	24	
Colonel Woodfall - - - -	Coonoor - - - -	12	
Colonel Angelo, Rev. E. Laseron - - - -	Ootacamund - - - -	18	
Captain R. N. Taylor - - - -	Coorg - - - -	96	
Colonel Cooper - - - -	Kotagherry - - - -	12	
TOTAL Number of Plants - - - -		4,109	

Ootacamund. 8 September 1863.

(signed) *W. G. McIvor,*
Superintendent Government Chinchona Plantations.

— No. 11. —

From the Government of Madras to the Secretary of State for India.

Madras, 17 October 1863.

WE have the honour to forward for your information the accompanying Tabular Report on the number, condition, &c., of the Chinchona plants on the Neilgherries on the 30th September 1863,

Enclosure in No. 11.

From *W. G. McIvor*, Esq., Superintendent Government Chinchona Plantations, Ootacamund, to *J. D. Sim*, Esq., Secretary to Government, Revenue Department, Fort St. George, Madras, 1863, No. 95.

Ootacamund, 10 October 1863.

WITH reference to the Order of Government, dated 22d. October 1862, No. 2263, I have the honour to enclose the report for last month of our progress in the Chinchona operations.

REPORT on the Number, Distribution, and Condition of Chinchona Plants on the Neilgherries, on the 30th September 1863.

No. of Species.	Botanical Names.	Commercial Names.	Number of Plants.	Value per lb. of Dry Bark in the London Market.		REMARKS.
				s. d.	s. d.	
1	<i>C. succirubra</i> - -	Red Bark - -	76,599	2 6	to 8 9	<p>During the month 667 plants were planted out in the plantations, making the total number permanently planted out 66,822.</p> <p>The increase by propagation being 15,874, or 1,666 plants above the average of the last six months, making the total number of plants 233,476.</p>
2	<i>C. Calisaya</i> - -	Yellow Bark - -	1,725	2 10	to 7 -	
3	<i>C. officinalis</i> , var. <i>Condaminea</i> (<i>C. Uritusinga</i>).	Original Loxa Bark -	2,880	2 10	to 7 -	
4	<i>C. officinalis</i> , var. <i>Bonplandiana</i> (<i>C. Chahuarguera</i>).	Select Crown Bark -	126,863	2 10	to 7 -	
5	<i>C. crepillia</i> - -	Fine Crown Bark - -	1,280	2 10	to 6 -	
6	<i>C. lancifolia</i> - -	Pitayo Bark - -	6	1 8	to 2 10	
7	<i>C. nitida</i> - -	Genuine Grey Bark -	8,394	1 8	to 2 9	
8	<i>C. species</i> without name.	Fine Grey Bark - -	2,734	1 8	to 2 10	
9	<i>C. micrantha</i> - -	Grey Bark - -	9,473	1 8	to 2 9	
10	<i>C. Peruviana</i> - -	Finest Grey Bark -	3,097	1 8	to 2 10	
11	<i>C. Pahudiana</i> - -	Unknown - -	425	Worthless.		
TOTAL Number of Plants - - -			233,476			

TABLE II.

MEMORANDUM of the Growth of Eleven Plants of *C. succirubra*, planted on the Second Denison Plantation, at Neddivuttum, on 30 August 1862.

Number of Plants.	Height in Inches when Planted on the 30 August 1862.	Height in Inches on the 31 August 1863.	Height in Inches on the 30 September 1863.	Growth in Inches during Sept. 1863.	By Whom Planted.
1	23	61	82½	1½	<p>His Excellency Sir W. Denison.</p> <p>J. W. Brecks, Esq. Dr. Sanderson. J. D. Sim, Esq. Lieutenant McLeod. P. Grant, Esq.</p> <p>Growth of the plants cut down for the bark sent to England in March 1863.</p>
2	16½	76	76	-	
3	19	70	78	8	
4	15	77	77	-	
5	27	88	92	4	
6	20	66	66½	½	
7	20	75	77	2	
8	18	76	78	2	
9	20	76	78	2	
10	20	85	88	3	
11	18	79	81	2	
12	-	9	12	3	
13	-	10	13	3	

TABLE II. exhibits the growth of 11 plants planted out by his Excellency the Governor and other gentlemen, on the 30th August 1862. The average growth of these plants during the month is 1½ inches, or 3¼ inches under the average growth of last month. This has been caused by the continued rains, which undoubtedly retard the growth of the plants. The two plants cut down on the 20th March last for the bark submitted to Mr. Howard for analysis, have made strong shoots from 12 to 18 inches in height.

TABLE III.

SHOWING the Height of Twelve Plants of *C. officinalis* planted on the Dodabetta Plantations, on the 30 September 1863.

Number of Plants.	Height in Inches when Planted on the 30th September 1863.	REMARKS.
1	19	TABLE III. has been introduced in this report to illustrate the monthly growth of the <i>Chinchona Officinalis</i> (a shrubby species) on the Dodabetta plantation, in order to enable a comparison to be made between the growth of these plants and the 11 plants of <i>Chinchona succirubra</i> on the Neddivuttum Plantation.
2	14½	
3	28	
4	22	
5	21½	
6	28	
7	22½	
8	21½	
9	21½	
10	19½	
11	24	
12	24	

TABLE IV.

MEMORANDUM of *Chinchona* Plants distributed.

NAMES.	STATIONS.	Number of Plants.
Mr. F. N. Maltby - - - -	Travancore - - - -	18
Dr. Junghun - - - -	Java - - - -	56
Mr. A. R. Lascelles - - - -	Ootacamund - - - -	12
Mr. M. Anderson - - - -	Jamaica - - - -	2
Dr. Wiehe - - - -	Bombay - - - -	10
Dr. T. Anderson - - - -	Calcutta - - - -	554
Dr. Jamieson - - - -	Saharanpore - - - -	107
Professor Lees - - - -	Calcutta - - - -	61
Rajah of - - - -	Travancore - - - -	521
Major Morgan - - - -	Ootacamund - - - -	216
Mr. E. T. Fitzgerald - - - -	Calcutta - - - -	261
Mr. J. W. Money - - - -	Ditto - - - -	581
Dr. W. Bourne - - - -	Ditto - - - -	420
Captain Cox - - - -	Wainad - - - -	6
Mr. Hallock - - - -	Ditto - - - -	2
Mr. T. Sheffield - - - -	Ootacamund - - - -	12
Mr. F. Day - - - -	Cochin - - - -	100
Mr. Brown - - - -	Tellicherry - - - -	12
Mr. J. Hall - - - -	Ootacamund - - - -	144
Mr. J. Knop - - - -	Ditto - - - -	18
Captain Lees - - - -	Bengal - - - -	281
Mr. W. H. Rayne - - - -	Manantoddy - - - -	24
Rev. Sayer - - - -	Ootacamund - - - -	12
Mr. Friend - - - -	Ditto - - - -	12
Mr. Hallock - - - -	Ditto - - - -	1
Mr. J. Pierie - - - -	Calicut - - - -	12
Colonel Scott - - - -	Ootacamund - - - -	212
Mr. F. Berend - - - -	Ditto - - - -	275
Rev. J. Hunter - - - -	Coonoor - - - -	12
Mr. J. Mullaly - - - -	Ditto - - - -	24
Mr. W. H. Stanes - - - -	Ditto - - - -	12
Col. R. Cooper - - - -	Kotagherry - - - -	12
Mr. F. Cockburn - - - -	Ditto - - - -	12
Colonel Woodfall - - - -	Coonoor - - - -	12
Mr. C. Anderson - - - -	Ditto - - - -	12
Colonel Angelo - - - -	Ootacamund - - - -	12
Rev. E. Laseron - - - -	Ditto - - - -	6
Captain R. N. Taylor - - - -	Coorg - - - -	96
Major W. Agnew - - - -	Assam - - - -	189
Mr. V. H. Levinge - - - -	Madura - - - -	12
Chief Commissioner - - - -	Nagpore - - - -	28
Mr. Fletcher - - - -	Ootacamund - - - -	24
Gool Mahamud - - - -	Ditto - - - -	20
TOTAL Number of Plants - - -		4,373

The number of plants issued to the public is 264, making the total number distributed 4,373. The height of the largest plant is 9 feet 6 inches, the circumference of the stem at 6 inches above the ground, being 9½ inches.

Ootacamund,
10 October 1863.

(signed) *W. G. McIvor*,
Superintendent Government *Chinchona* Plantations.

— No. 12. —

From the Government of Madras to the Secretary of State for India.

Madras, 11 November 1863.

IN continuation of our letter, 12 September 1863, No. 97, we have the honour to forward a further letter from Mr. McIvor, the Superintendent of the Government Chinchona Plantations, relative to the increase of salary solicited by him; together with our proceedings thereon, dated 5th instant, No. 1993, from which you will observe that, considering Mr. McIvor to have a fair claim to travelling allowance, we have granted him the same rate as is drawn by deputy collectors and magistrates of the first class, viz., three rupees per diem, and have permitted him to draw this allowance throughout the year.

Enclosure in No. 12.

From *W. G. McIvor, Esq.*, Superintendent Government Chinchona Plantations, to *J. D. Sim, Esq.*, Secretary to Government, Revenue Department, Fort St. George.

Sir,

Ootacamund, 10 October 1863.

1. THE Government, in their Order of the 12th September 1863, No. 1687, being unable to accede to my proposal, and having been pleased to express their intention to recommend to the Secretary of State that I be allowed to draw pay at the rate of 500 rupees per mensem from the 1st January 1864, I would most respectfully solicit the favour of this communication, together with my letter of the 13th August 1863, being forwarded for the consideration of the Right Honourable the Secretary of State for India with the recommendation above mentioned.

2. I beg to bring to the notice of Government, that the conduct of the Chinchona operations shall always have my best exertions and utmost care, without reference to pay, as, in fact, any remuneration the Government can allow me is but a small reward compared to the gratification conveyed to my mind by the daily development of the correctness of all that I have advanced with reference to the treatment of the plants, combined with the great success of our operations, and the consciousness that our labours will confer great benefit to the present and to future generations.

3. The reason for bringing the subject of my pay under the consideration of your Honourable Government was because the sum hitherto allowed me has scarcely met the additional expenditure imposed upon me by the direction of the Chinchona operations, and I felt confident the Government would not wish this to exist in the present state of the undertaking. Besides other expenses, the plantations being a great distance apart necessitates the keep of additional servants and three horses, in order to enable me frequently to visit them, as well as the selected sites, for the purpose of making observations.

4. I respectfully submit that the value of my services, and the direct saving I have effected to the State, are well known to Government; I therefore feel it sufficient briefly to observe, for the information of the Secretary of State, that, having been trained from my youth to the treatment of plants, and possessing an intimate knowledge of this climate and its effects on vegetation, together with a natural talent for the management of labour and the direction of operations, has enabled me to produce for the Government results in this important undertaking which have never been equalled. In order to form an idea of what we have accomplished, a comparison is necessary, and I select for this the cultivation of the plants in their "proper home in the moist region of Darjeeling," under the superintendence of Dr. Anderson.

5. Dr. Anderson commenced the cultivation of Chinchonas in the Calcutta Botanical Gardens in the early part of 1861, and by the end of February of that year had raised "about 80 seedlings," or a greater number by 15 plants than we had on the Neilgherries at that date. Dr. Anderson received a subsequent supply of plants and seed from Java, and 564 plants were supplied to that gentleman from our nurseries. His report of the 3d August 1863 gives the expenditure on the plants at Darjeeling, to the 30th of April last, at Rs. 11,639. 2. 6. The number of plants on the 30th April are not given, but the report shows the number on the 1st of that month to be (deducting the worthless species *Pahudiana*) 919; add to this number 570, the maximum increase which could have been obtained in April, makes the total number of plants on the 30th of April, 1,489: thus the actual cost of each plant to the Bengal Government is Rs. 7. 12. 7.

PAPERS RELATING TO THE INTRODUCTION

6. The cost of our propagation and nursery departments, from the commencement up to the same date (30th April 1863), being as follows:—

	<i>Rs.</i>	<i>a.</i>	<i>p.</i>
Deputy Superintendent's salary - - - - -	2,497	15	3
Permanent Establishment - - - - -	2,882	-	-
Saderwarid and Contingencies - - - - -	1,607	-	-
Add interest at 10 per cent. for 1½ years on 3,370 rupees expended on permanent buildings in 1861-62 - - -	505	8	-
Ditto for one year on 2,522 rupees expended on permanent buildings in 1862-63 - - - - -	252	3	2
Total Expenditure to the 30th April 1863 -	7,744	10	5
Our number of plants on the 30th April last (deducting the worthless species <i>Pahudiana</i>) was 159,907, making the cost of our plants to Government 9½ of a pie, or about one penny each, while, had our plants been produced at the rate at Darjeeling, the cost to Government of 159,907 plants would be - - - - -			
	12,45,109	3	1
From which deducting our expenditure of - - - - -	7,744	10	5
Gives a net saving to Government on the propagating and nursery departments alone of - - - - - <i>Rs.</i>			
	12,37,364	8	8

and, in addition to this large saving of upwards of 123,000 *l.* sterling, the saving in time may be considered as even more important.

7. In order to avoid delay, I undertook the construction of the buildings required for the plantations and propagating departments. These I have completed in the most efficient manner, and in the shortest possible space of time, at certainly one-half of the amount they would have cost Government had they been erected by the Department of Public Works, so that in the buildings alone, a work to which I have not been trained, my resource and exertions in directing the labour has effected a saving of over 19,000 rupees on the engineer's estimates.

8. I am unable to give a comparison of the saving effected on the formation of our plantations; as elsewhere this stage has not been attained in the cultivation of the plants; I trust, however, that the above facts are sufficient to secure the favourable consideration of my claim to the increase of salary solicited in my letter of the 13th August last.

ORDER of the MADRAS GOVERNMENT, 5 November 1863.

1. THE Government consider that Mr. McIvor has a fair claim to travelling allowance, and resolve to grant him the same rate as is drawn by deputy collectors and magistrates of the first class, viz., three rupees per diem. Mr. McIvor will draw this throughout the year.

2. The above Order will be reported to the Home Government in continuation of the Despatch dated 12 September 1863, No. 97.

J. D. Sim,
Secretary to Government.

— No. 13. —

From the Government of Madras to the Secretary of State for India.

Madras, 20 November 1863.

We have the honour to forward, for your information, the accompanying * Proceedings of Government, 19 November 1863, Nos. 247 and 248. Tabular Report* on the number, condition, &c., of the Chinchona Plants on the Neilgherries, on the 31st October 1863.

Enclosure in No. 13.

REPORT on the Number, Distribution, and Condition of Chinchona Plants on the Neilgherries, on 31 October 1863.

No. of Species.	Botanical Names.	Commercial Names.	Number of Plants.	Value per lb. of Dry Bark in the London Market.		REMARKS.
				s. d.	s. d.	
1	<i>C. succirubra</i> - -	Red Bark - -	80,550	2 6	to 8 9	The planting season having passed, the number of plants permanently planted out on the plantations remain the same as at the end of last month, viz., 66,622. The increase by propagation during the month is 14,897, or 155 plants under the average of the last six months, making the total number of plants 248,166.
2	<i>C. Calisaya</i> - -	Yellow Bark - -	1,735	2 10	to 7 -	
3	<i>C. officinalis</i> , var. <i>Condaminea</i> (<i>C. Uritusinga</i>).	Original Loxa Bark	4,733	2 10	to 7 -	
4	<i>C. officinalis</i> , var. <i>Bonplandiana</i> (<i>C. Chahuarguera</i>).	Select Crown Bark -	135,358	2 10	to 7 -	
5	<i>C. crespilla</i> - -	Fine Crown Bark - -	1,373	2 10	to 6 -	
6	<i>C. lancifolia</i> - -	Pitayo Bark - -	6	1 8	to 2 10	
7	<i>C. nitida</i> - -	Genuine Grey Bark	8,399	1 8	to 2 9	
8	<i>C. Species</i> without name.	Fine Grey Bark - -	2,736	1 8	to 2 10	
9	<i>C. micrantha</i> - -	Grey Bark - -	9,719	1 8	to 2 9	
10	<i>C. Peruviana</i> - -	Finest Grey Bark - -	3,132	1 8	to 2 10	
11	<i>C. Pahudiana</i> - -	Unknown - -	425	Worthless.		
TOTAL Number of Plants - - -			248,166			

TABLE II.

MEMORANDUM of the Growth of Eleven Plants of *C. succirubra*, planted on the Second Denison Plantation, at Neddivuttum, on 30 August 1862.

Number of Plants.	Height in Inches when Planted on 30 August 1862.	Height in Inches on 30 September 1863.	Height in Inches on 31 October 1863.	Growth in Inches during October 1863.	By whom Planted.
1	23	62½	67	4½	His Excellency Sir W. Denison. J. W. Breeks, Esq. Dr. Sanderson. J. D. Sim, Esq. Lieutenant McLeod. P. Grant, Esq. Growth of the plants cut down for the bark sent to England.
2	16½	76	80	4	
3	19	73	76	3	
4	15	77	81½	4½	
5	27	92	96	4	
6	20	66½	69½	3	
7	20	77	82	5	
8	18	78	83	5	
9	20	78	82½	4½	
10	20	88	90½	2½	
11	18	81	83	2	
12	-	19	18	4	The two plants cut down on the 20th March last, for the bark submitted to Mr. Howard for analysis, have made strong shoots of 16 inches in height. The average growth of these during the month is 3½ inches, or ½ an inch above the growth of last month.
13	-	13	16	3	

TABLE III.

SHOWING the Height of Twelve Plants of *C. officinalis* planted on the Dodabetta Plantations, at Ootacamund on the 30th September 1863.

Number of Plants.	Height in Inches when Planted on the 30th September 1863.	Height in Inches on the 31st October 1863.	Growth in Inches during October 1863.	REMARKS.
1	19	22	3	The 12 plants of <i>Chinchona officinalis</i> (a shrubby species) on the Dodabetta Plantation, gives an average growth of $3\frac{1}{2}$ inches during the month, or $\frac{1}{3}$ th of an inch above the growth of the <i>Neddivuttum</i> plants. A heavy storm on the 14th, 15th, and 16th of last month did considerable damage, breaking 35 of our largest plants, and causing the entire loss of 253 smaller plants, which were either buried under land slips or washed away by the flood.
2	14 $\frac{1}{2}$	16 $\frac{1}{2}$	2	
3	28	31 $\frac{1}{2}$	3 $\frac{1}{2}$	
4	22	25	3	
5	21 $\frac{1}{2}$	24 $\frac{1}{2}$	3	
6	28	31 $\frac{1}{2}$	3 $\frac{1}{2}$	
7	22 $\frac{1}{2}$	25	2 $\frac{1}{2}$	
8	21 $\frac{1}{2}$	27	5 $\frac{1}{2}$	
9	21 $\frac{1}{2}$	26 $\frac{1}{2}$	5	
10	19 $\frac{1}{2}$	23 $\frac{1}{2}$	4	
11	24	26 $\frac{1}{2}$	2 $\frac{1}{2}$	
12	24	25	1	

TABLE IV.

MEMORANDUM of *Chinchona* Plants distributed.

NAMES.	STATIONS.	Number of Plants.
Mr. F. N. Maltby	Travancore	16
Dr. Junghun	Java	56
Mr. A. R. Lascelles	Ootacamund	12
" M. Anderson	Jamaica	2
Dr. Wiehe	Bombay	10
" F. Anderson	Calcutta	554
" Jamieson	Saharanpore	107
Professor Lees	Calcutta	61
Rajah of	Travancore	521
Major Morgan	Ootacamund	216
Mr. E. F. Fitzgerald	Calcutta	261
" J. W. Money	ditto	581
Dr. W. Bourne	ditto	420
Captain Cox	Wainad	6
Mr. Hallock	ditto	2
" T. Sheffield	Ootacamund	12
" F. Day	Cochin	100
" Brown	Tellicherry	12
" J. Hall	Ootacamund	144
" J. Knop	ditto	18
Captain Lees	Bengal	281
Mr. W. H. Rayne	Manantoddy	24
Rev. Sawyer	Ootacamund	12
Mr. Friend	ditto	12
" Hallock	ditto	1
" J. Perie	Calicut	12
Colonel Scott	Ootacamund	212
Mr. F. Berend	ditto	275
Rev. J. Hunter	Coonoor	12
Mr. J. Mullaly	ditto	24
" W. H. Stanes	ditto	12
Colonel R. Cooper	Kotagherry	12
Mr. F. Cockburn	ditto	12
Colonel Woodfall	Coonoor	12
Mr. C. Anderson	ditto	24
Colonel Angelo	Ootacamund	12
Rev. E. Laseron	ditto	12
Captain R. N. Taylor	Coorg	96
Major W. Agnew	Assam	139
Mr. V. H. Levinge	Madura	12
Chief Commissioner	Nagpore	28
Mr. Fletcher	Ootacamund	24
Gool Mahomed	ditto	20
General McCleverty	New Zealand	23
Mr. W. Robinson	Kotagherry	6
" Crane	Wainad	12
" H. R. Dawson	Seegoor	12
Captain Mann	Coorg	36
		4,480

The number of plants issued to the public is 107, making the total number of plants distributed 4,480.

Ootacamund,
11 November 1863.

(signed) W. G. McIvor,
Superintendent Government *Chinchona* Plantations.

— No. 14. —

From the Government of Madras to the Secretary of State for India.

Madras, 11. December 1863.

We have the honour to forward for your information the accompanying Tabular Report* on the number, condition, &c., of the Chinchona Plants on the Neilgherries on the 30th November 1863.

* Proceedings of Government, 11 December 1863, Nos. 185 and 186.

Enclosure in No. 14.

From *W. G. McIvor*, Esq., Superintendent Government Chinchona Plantations, to *J. D. Sim*, Esq., Secretary to Government, Revenue Department, Fort St. George.

Sir,

Ootacamund, 7 December 1863.

As the progress of Chinchona cultivation in India is attracting the attention of many scientific gentlemen in Europe, I am frequently asked for information on the subject; and therefore respectfully beg to solicit the favour of being regularly furnished with six copies of my monthly reports for distribution.

REPORT on the Number, Distribution, and Condition of Chinchona Plants on the Neilgherries, on 30 November 1863.

No. of Species.	Botanical Names.	Commercial Names.	Number of Plants.	Value per lb. of Dry Bark in the London Market.		REMARKS.
				s. d.	s. d.	
1	<i>C. succirubra</i> - -	Red Bark - -	82,558	2 6	to 8 9	The planting season having passed, the number of plants permanently planted out in the plantations remain the same as at the end of last month, viz., 68,622. The increase by propagation during the month is 18,312 or 2,129 plants under the average of the last six months, making the total number of plants 259,396.
2	<i>C. Calisaya</i> - -	Yellow Bark - -	1,750	2 10	to 7 0	
3	<i>C. officinalis</i> , var. <i>Condaminea</i> (<i>C. Uritusinga</i>).	Original Loxa Bark	6,219	2 10	to 7 0	
4	<i>C. officinalis</i> , var. <i>Bonplandiana</i> (<i>C. Chahuarguera</i>).	Select Crown Bark -	142,717	2 10	to 7 0	
5	<i>C. crespilla</i> - -	Fine Crown Bark - -	1,449	2 10	to 6 0	
6	<i>C. lancifolia</i> - -	Pitayo Bark - -	6	1 8	to 2 10	
7	<i>C. nitida</i> - -	Genuine Grey Bark	8,402	1 8	to 2 9	
8	<i>C. Species</i> without name.	Fine Grey Bark - -	2,741	1 8	to 2 10	
9	<i>C. micrantha</i> - -	Grey Bark - -	9,986	1 8	to 2 9	
10	<i>C. Peruviana</i> - -	Finest Grey Bark - -	3,148	1 8	to 2-10	
11	<i>C. Pahudiana</i> - -	Unknown - -	42	Unknown.		
TOTAL Number of Plants: - - -			259,396			

TABLE II.

MEMORANDUM of the Growth of Eleven Plants of *C. succirubra*, planted on the Second Denison Plantations, at Neddivuttum, on 30 August 1862.

Number of Plants.	Height in Inches when Planted on 30 August 1862.	Height in Inches on 31 October 1863.	Height in Inches on 30 November 1863.	Height in Inches during November 1863.	By whom Planted.
1	23	87	92	5	His Excellency Sir William Denison. J. W. Brecks, Esq. Dr. Sanderson. J. D. Sim, Esq. Lieutenant McLeod. P. Grant, Esq.
2	16½	80	84	4	
3	19	76	79½	3½	
4	15	81½	84	2½	
5	27	96	98	2	
6	20	69½	73	3½	
7	20	82	89	7	
8	18	83	87	4	
9	20	82½	88	5½	
10	20	90½	94	3½	
11	18	83	85½	2½	

TABLE II. exhibits the growth of eleven plants planted out by his Excellency the Governor, and other gentlemen at Neddivuttum, on the 30th August 1862. The average growth of these plants during the month is 3¼ inches or ¼ inch above the average growth of last month.

The two plants cut down on the 20th of March last, for the bark submitted to Mr. Howard for analysis, have made strong shoots from 19 to 19½ inches in height. The average growth of these during the month is 3½ inches or ½ inch under the average growth of last month.

TABLE III.

SHOWING the Height of Twelve Plants of *C. officinalis*, planted on the Dodabetta Plantations at Ootacamund on 30 September 1863.

Number of Plants.	Height in Inches when Planted on 30 September 1863.	Height in Inches on 31 October 1863.	Height in Inches on 30 November 1863.	Growth in Inches during November 1863.	REMARKS.
1	19	22	25	3	The twelve plants of <i>Chinchona officinalis</i> (a shrubby species) on the Dodabetta plantation gives an average growth of three inches during the month, or $\frac{1}{2}$ inches under the growth of the Neddittum plants.
2	14 $\frac{1}{2}$	16 $\frac{1}{2}$	19 $\frac{1}{2}$	3	
3	26	31 $\frac{1}{2}$	34 $\frac{1}{2}$	3	
4	22	25	28	3	
5	21 $\frac{1}{2}$	24 $\frac{1}{2}$	27	2 $\frac{1}{2}$	
6	28	31 $\frac{1}{2}$	35	3 $\frac{1}{2}$	
7	22 $\frac{1}{2}$	25	28 $\frac{1}{2}$	3 $\frac{1}{2}$	
8	21 $\frac{1}{2}$	27	30	3	
9	21 $\frac{1}{2}$	26 $\frac{1}{2}$	29	2 $\frac{1}{2}$	
10	19 $\frac{1}{2}$	23 $\frac{1}{2}$	27	3 $\frac{1}{2}$	
11	24	26 $\frac{1}{2}$	29	2 $\frac{1}{2}$	
12	24	25	28	3	

TABLE IV.

MEMORANDUM of Chinchona Plants Distributed.

NAMES.	STATIONS.	No. of Plants.
Mr. F. N. Maltby	Travancore	16
Dr. Junghun	Java	56
Mr. A. R. Lascelles	Ootacamund	12
Mr. M. Anderson	Jamaica	2
Dr. Wiehe	Bombay	10
Dr. T. Anderson	Calcutta	554
Dr. Jamieson	Saharanpore	107
Professor Lees	Calcutta	61
Rajah of	Travancore	621
Major Morgan	Ootacamund	216
Mr. E. T. Fitzgerald	Darjeling	261
Mr. J. W. Money	ditto	581
Dr. W. Bowne	ditto	420
Captain Cox	Wainad	6
Mr. Hallock	ditto	2
Mr. T. Sheffield	Ootacamund	12
Dr. F. Day	Cochin	100
Mr. Brown	Tellicherry	12
Mr. J. Hall	Ootacamund	144
Mr. J. Knop	ditto	18
Captain Lees	Bengal	281
M. W. H. Rayne	Manantoddy	24
Reverend Sayer	Ootacamund	18
Mr. Friend	ditto	12
Mr. Hallock	ditto	1
Mr. J. Perie	Seegoor	12
Colonel Scott	Ootacamund	212
Mr. F. Berend	Cachar	275
Rev. J. Hunter	Coonoor	12
M. J. Mullaly	ditto	24
Mr. W. H. Stanes	ditto	12
Colonel R. Cooper	Kotagherry	12
Mr. F. Cockburn	ditto	12
Colonel Woodfall	Coonoor	12
M. C. Anderson	ditto	24
Colonel Angelo	Ootacamund	12
Rev. E. Laseron	ditto	12
Captain R. N. Taylor	Coorg	96
Major W. Agnew	Assam	139

The number of plants issued to the public is 2,082, making the total number of plants distributed 6,562.

TABLE IV.—MEMORANDUM of Chinchona Plants Distributed—*continued.*

NAMES.	STATIONS.	No. of Plants.	REMARKS.
Mr. V. H. Levinge	Madura	12	
Chief Commissioner	Nagpore	28	
Mr. Fletcher	Ootacamund	24	
Gool Mahomed	ditto	20	
General McCleverty	New Zealand	23	
Mr. W. Robinson	Kotagherry	6	
Mr. Crake	Wainad	12	
Mr. H. R. Dawson	Seegoor	12	
Captain Mann	Coorg	36	
Mr. E. Roberts	Ootacamund	6	
Mr. H. Rossall	Wainad	12	
Rev. Wait	Coonoor	2	
Mr. H. de Facien	Katarry	2,056	
TOTAL Number of Plants		6,562	

Ootacamund,
7 December 1863.

(signed) *W. G. McIvor,*
Superintendent Government Chinchona Plantations.

—No. 15.—

From Sir *Charles Wood* to the Government of Madras.

India Office, 30 January 1864.

1. I HAVE considered in Council your letters, in the Revenue Department, noted in the margin, reporting the progress of Chinchona cultivation on the Neilgherry Hills, which appears to me to be exceedingly satisfactory. That after less than three years there should be a quarter of a million of these valuable trees growing in India, 66,622 permanently planted out, and nearly 5,000 distributed amongst private cultivators, are results which reflect the highest credit on Mr. McIvor; while the fact that the whole number of plants authorised to be sold (100,000) has already been applied for, is a proof that the great importance of this cultivation is fully appreciated throughout India. I observe, too, with satisfaction, that on the whole the plants have passed through the trying and severe storms of July and August with as little injury as they experienced from the dry and cold weather of the winter months.

2. The specimens of Chinchona bark and leaves were duly received with your letter, dated October 9 (No. 110) 1863, and were sent to Mr. Howard for analysis. I now transmit 15 copies of that gentleman's report, which announces a result even more promising than the former analysis, and which will be valuable to Mr. McIvor in his investigations as to the best time for cutting the bark, and the most favourable conditions for the secretion of febrifuge alkaloids.

3. The suggestion contained in your letter, dated August 12th (No. 80) 1863, that the Government manufactory of quinine should eventually be established at Ootacamund will receive careful consideration; and, in a future despatch, I will inform you of the result of inquiries, which I shall cause to be made on the subject.

4. In former despatches I have expressed my sense of the value of Mr. McIvor's services, and I now cordially approve of the increase of salary and travelling allowances which you have granted to that gentleman, as reported in your letters, dated 12 September (No. 97), and 11 November (No. 120) 1863.

Dated—
16 June 1863.
13 July "
12 Aug. "
15 " "
12 Sept. "
25 " "
9 Oct. "
17 " "
11 Nov. "
20 " "
11 Dec. "

15

— No. 16. —

COPY PUBLIC DESPATCH to Madras, dated 29 February 1864, No. 10.

1. I HAVE given directions for the transmission of 11 copies of Mr. Howard's work on Chinchona plants ("Nueva Quinologia de Pavon") for distribution in your Presidency. It will be valuable for purposes of reference to all persons who are interested in Chinchona cultivation; and copies should be forwarded to the public libraries in Madras, to the office of the Conservator of Forests, to station libraries in the hill districts, and to the offices of collectors or assistants to collectors in those collectorates and districts where the Chinchona plant has been or is likely to be brought under cultivation.

2. Mr. McIvor, the Superintendent of Chinchona Plantations on the Neilgherry Hills, has already been supplied with a copy of this work.

— No. 16 a. —

REPORT on the Bark and Leaves sent home in October 1863 for Examination by *J. E. Howard*, Esq.

(See Mr. *McIvor's* letter dated 3d October 1863.)

From *J. E. Howard*, Esq., to The Under Secretary of State for India.

Sir,

December 1863.

THE box of specimens reached me in good condition, and has furnished valuable materials for further research, although the quantity of bark sent this time amounted to but a few ounces in weight. Several pounds weight of leaves (well-dried and with a marked tea-like fragrance) have allowed me the opportunity of following various lines of experiment, in order to ascertain their probable commercial value. I regret to be obliged to confirm the opinion I expressed in my last, that the leaves will not supply material for the extraction of quinine, although the quantity of the first rough precipitate from an acid solution, having the appearance of a hydrated alkaloid, is considerably more than I succeeded in obtaining before, being equal to 1.31 per cent. of the weight of the leaves. Of this a small portion was soluble in ether, to the extent of 0.17 per cent., forming a clear yellow solution which precipitates on the addition of a solution of oxalic acid in spirit of wine. Nevertheless, the further prosecution of the inquiry and the attempt to purify the alkaloid, showed me clearly that I had to do with a state of things very different from that which exists in the bark, and that I should not succeed in obtaining an available salt of quinine. I hope to be able to prosecute this research on a still larger quantity of the material in order to test the conclusions to which my present investigation tends. The alkaloid exists in the leaves in very intimate relationship with the green colouring matter. This latter substance is well deserving of a more elaborate investigation as it seems to be somewhat analogous to indigo, and its ethereal solution has a peculiar effect on the rays of light, the reflected ray having almost a blood-red colour, whilst the transmitted ray is a fine green.

I will now notice the remaining specimens. Nos. 1 and 2, though presenting a promising appearance, were in too small quantity to justify examination. No. 3, "red bark from branches of 18 months and under" yielding me not less than 6 per cent. of rough alkaloid, but of this a larger proportion seemed to be *Quindine* and *Chinchonidine*, but as I had little more than an ounce of bark to examine, I cannot consider this comparative result as an ascertained fact. As these barks were cut at the period when the sap is in full flow, it is not at all improbable that the alkaloids may vary somewhat from those produced at a different season. The above 6 per cent. of alkaloid yielded in a state of further purification 4.10 per cent.

cent. of *Quinidine*, *Chinchonidine*, and *Quinine*, and also a portion, 0.9 per cent., insoluble in ether, in all 5 per cent. The portion insoluble in ether and not capable of being crystallised from spirit I set down as *Chinchonicine*, and not pure *Chinchonine*, of which last I find but few indications in these young barks. The *Quinidine* crystallises as hydriodate, and the *Chinchonidine* as a resinous mass when united with hydriodic acid. Both form a feathery crystallisation as sulphates.

No. 5, "Red Bark from small branches broken by the wind," gave a result very nearly resembling the analysis of the leaves. This is not surprising, considering the very immature state of these succulent branches. I obtained 1 per cent. of alkaloid soluble in ether, which gave a doubtful trace of crystallisation as sulphate. A further portion of impure alkaloid insoluble in ether resembled the same substance as described under No. 3.

The No. 8, *Ch. micrantha* bark, from small branches broken by the wind, gave, on examination, more chincho-tannic acid than No. 5. The precipitated alkaloids appeared to be, as above, 1 per cent., but of this 0.40 per cent. proved to be oxydised tannin, and insoluble in ether. The rest in part crystallised from ether, and in part formed a quinine-like mass. The crystalline portion formed crystals as hydriodate, indicating the *Quinidine* of Pasteur. The total proved to be *Quinidine* (*Quinine*?) and a trace of *Chinchonine* 0.60 per cent.

No. 9, *Ch. Pahudiana* contained more chincho-tannic acid than even the last. The precipitate of alkaloid was minute, and much implicated with stringent colouring matter. Ether dissolved a small portion, in which, on evaporation, crystals could be perceived. This bark, in the state in which sent, has scarcely any bitter taste, and would be worthless in commerce. I cannot say what the mature bark might be after some years' growth, but doubt whether it can ever repay the expense of cultivation. I may remark that this bark a good deal resembles that of *Ch. purpurea* in its external appearance; and also that the bark of *Ch. micrantha* now sent has much the same character as that which characterises the bark of the same *Chinchona* as grown in South America.

I find similar characteristic colouring in the leaves of the three species sent, *Chinchona officinalis micrantha*, and *succirubra*. The same also seems (a little altered) to prevade the specimen of wood, marking a difference from the heart wood of *Ch. succirubra* of many years' growth which I have before examined.

I have &c.,

John Eliot Howard.

— No. 17.—

From the Government of Madras to the Secretary of State for India.

Madras, 11 January 1864.

We have the honour to forward for your information the accompanying tabular Report* on the number, condition, &c., of the Chinchona plants on the Neilgherries on the 31st December 1863.

* Proceedings of Government, 11 January 1864, Nos. 102 and 103.

Enclosure in No. 17.

REPORT on the Number, Distribution, and Condition of Chinchona Plants on the Neilgherries, on 31 December 1863.

No. of Species.	Botanical Names.	Commercial Names.	Number of Plants.	Value per Lb. of Dry Bark in the London Market.		REMARKS.
				s. d.	s. d.	
1	<i>C. succirubra</i> - -	Red Bark - -	86,742	2 6	to 8 9	The planting season having passed, the number of plants permanently planted out on the plantations remain the same as at the end of last month, viz., 66,622. The increase by propagation during the month is 18,657, or 2,603 plants above the average of the last six months, making the total number of plants 277,083.
2	<i>C. Calisaya</i> - -	Yellow Bark - -	1,768	2 10	to 7 -	
3	<i>C. officinalis</i> , var. <i>Condaminea</i> (<i>C. Uritusinga</i>).	Original Loxa Bark	6,350	2 10	to 7 -	
4	<i>C. officinalis</i> , var. <i>Bonplandiana</i> (<i>C. Chahnarguera</i>).	Select Crown Bark -	155,780	2 10	to 7 -	
5	<i>C. crespilla</i> - -	Fine Crown Bark -	1,569	2 10	to 6 -	
6	<i>C. lancifolia</i> - -	Pitayo Bark - -	6	1 8	to 2 10	
7	<i>C. nitida</i> - -	Genuine Grey Bark -	8,406	1 8	to 2 10	
8	<i>C. species</i> without name.	Fine Grey Bark -	2,746	1 8	to 2 9	
9	<i>C. micrantha</i> - -	Grey Bark - -	10,139	1 8	to 2 10	
10	<i>C. Peraviana</i> - -	Finest Grey Bark -	3,153	1 8	to 2 9	
11	<i>C. Pahudiana</i> - -	Unknown - -	425	Unknown.		
TOTAL Number of Plants - - -			277,083			

TABLE II.

MEMORANDUM of the Growth of Eleven Plants of *C. succirubra*, planted on the Second Denison Plantation, at Neddivuttum, on 30 August 1862.

Number of Plants.	Height in Inches when Planted, on 30 August 1862.	Height in Inches on 30 November 1863.	Height in Inches on 31 December 1863.	Height in Inches during December 1863.	By Whom Planted.
1	23	92	93	1	His Excellency Sir William Denison. J. W. Breeks, Esq. Dr. Sanderson. J. D. Sim, Esq. Lieutenant McLeod. P. Grant, Esq.
2	16½	84	86	2	
3	19	79½	81	1½	
4	15	84	86	2	
5	27	98	99	1	
6	20	73	74	1	
7	20	80	90	1	
8	18	87	89	2	
9	20	88	89	1	
10	20	94	94	-	
11	18	85½	87	1½	

TABLE II. exhibits the growth of 11 plants planted out by his Excellency the Governor and other gentlemen at Neddivuttum on the 30th August 1862. The average growth of these plants during the month is 1½ inches, or 2 inches less than the average growth of last month.

The two plants cut down on the 20th of March last, for the bark submitted to Mr. Howard for analysis, have made strong shoots from 19½ to 21 inches in height. The average growth of these plants during the month is 2 inches, or ½ inch under the average growth of last month.

TABLE III.

SHOWING the Height of Twelve Plants of *C. officinalis* planted on the Dodabetta Plantation at Ootacamund on the 30th September 1863.

Number of Plants.	Height in Inches when Planted on the 30th September 1863.	Height in Inches on the 30th November 1863.	Height in Inches on the 31st December 1863.	Growth in Inches during December 1863.	REMARKS.
1	19	25	28	8	<p>The 12 plants of <i>Chinchona officinalis</i> (a shrubby species) on the Dodabetta Plantation gives an average growth of 2½ inches during the month, or ½ inch under the average growth of last month.</p> <p>The number of plants issued to the public is 970, making the total number of plants distributed 7,582.</p> <p>A few capsules on the flowering plant of <i>Chinchona succirubra</i> are fully formed and have every appearance of maturing seeds.</p>
2	14½	19½	22	2½	
3	28	34½	41	6½	
4	22	28	30	2	
5	21½	27	29	2	
6	28	35	38	3	
7	22½	28½	29½	1	
8	21½	30	32½	2½	
9	21½	29	32	3	
10	19½	27	29	2	
11	24	29	31	2	
12	24	28	30	2	

TABLE IV.

MEMORANDUM of Chinchona Plants Distributed.

NAMES.	STATION.	Number of Plants.
Mr. F. N. Maltby	Travancore	16
Dr. Junghuhn	Java	56
Mr. A. R. Lascelles	Ootacamund	12
„ M. Anderson	Jamaica	2
Dr. Wiehe	Bombay	10
„ T. Anderson	Calcutta	554
„ Jamieson	Saharanpore	107
Professor Lees	Calcutta	61
Rajah of	Travancore	521
Major Morgan	Ootacamund	216
Mr. E. T. Fitzgerald	Calcutta	261
„ J. W. Money	- ditto -	581
Dr. W. Bourne	- ditto -	420
Captain Cox	Wainad	6
Mr. Hallock	- ditto -	2
„ T. Sheffield	Ootacamund	12
Dr. F. Day	Cochin	100
Mr. Brown	Tellicherry	12
„ J. Hall	Ootacamund	144
„ J. Knop	- ditto -	18
Captain Lees	Bengal	281
Mr. W. H. Rayne	Manantoddy	24
Rev. Sawyer	Ootacamund	18
Mr. Friend	- ditto -	12
„ Hallock	- ditto -	1
„ J. Perie	Seegoor	12
Colonel Scott	Ootacamund	212
Mr. F. Berend	Cachar	275
Rev. J. Hunter	Coonoor	12
Mr. J. Mullaly	- ditto -	24
„ W. H. Stanes	- ditto -	13
Colonel R. Cooper	Kotagherry	12
Mr. F. Cockburn	- ditto -	12
Colonel Woodfall	Coonoor	12
Mr. C. Anderson	- ditto -	24

TABLE IV.—Memorandum of Chinchona Plants Distributed—*continued.*

NAMES.	STATION.	Number of Plants.	REMARKS.
Colonel Angelo - - - -	Ootacamund - -	12	
Rev. E. Laseron - - - -	- ditto - - -	12	
Captain R. N. Taylor - - - -	Coorg - - -	96	
Major W. Agnew - - - -	Assam - - -	139	
Mr. V. H. Levinge - - - -	Madura - - -	12	
Chief Commissioner - - - -	Nagpore - - -	28	
Mr. Fletcher - - - -	Ootacamund - -	24	
Gool Mahomed - - - -	- ditto - - -	20	
General McCleverty - - - -	New Zealand - -	28	
Mr. W. Robinson - - - -	Kotagherry - -	6	
„ Crake - - - -	Wainad - - -	12	
„ H. R. Dawson - - - -	Seegoor - - -	12	
Captain Mann - - - -	Coorg - - -	36	
Mr. E. Roberts - - - -	Ootacamund - -	6	
„ H. Rossall - - - -	Wainad - - -	12	
Rev. Wait - - - -	Coonoor - - -	2	
M. H. de Facien - - - -	Katarry - - -	2,761	
Collector of - - - -	Belgaum - - -	28	
Collector of - - - -	Honore - - -	28	
Dr. Ross - - - -	- ditto - - -	15	
His Excellency the Governor - -	Bombay - - -	158	
M. A. Hinde - - - -	Wainad - - -	12	
„ E. P. Thomas - - - -	Coonoor - - -	12	
Rajab - - - -	Poonganoor - -	12	
TOTAL Number of Plants - -		7,532	

Ootacamund,
9th January 1863.

(signed) *W. G. McIvor*,
Superintendent Government, Chinchona Plantations.

— No. 18. —

From the Government of Madras to the Secretary of State for India.

Madras, 23 February 1864.

WE have the honour to forward for your information the accompanying Tabular Report on the Number, Condition, &c., of the Chinchona Plants on the Neilgherries on the 31st January 1864.

Enclosure in No. 18.

REPORT on the Number, Distribution, and Condition of Chinchona Plants on the Neilgherries, on 31st January 1864.

No. of Species.	Botanical Names.	Commercial Names.	Number of Plants.	Value per Lb. of Dry Bark in the London Market.		REMARKS.
				s. d.	s. d.	
1	<i>C. succirubra</i> - -	Red Bark - -	88,424	2 6	to 8 9	The number of plants permanently planted out remain as formerly, viz., 66,622. The increase by propagation during the month is 16,117, being 633 plants under the average results of the last six months, making the total number of plants at the end of the month 291,607.
2	<i>C. calisaya</i> - -	Yellow Bark - -	1,766	2 10	to 7 -	
3	<i>C. officinalis</i> var. <i>Condaminea</i> (<i>C. Uritusinga</i>).	Original Loxa Bark -	6,434	2 10	to 7 -	
4	<i>C. officinalis</i> var. <i>Bonplandiana</i> (<i>C. Chahuarguera</i>).	Select Crown Bark -	168,518	2 10	to 7 -	
5	<i>C. crespilla</i> - -	Fine Crown Bark -	1,589	2 10	to 6 -	
6	<i>C. lancifolia</i> - -	Pitayo Bark - -	6	1 8	to 2 10	
7	<i>C. nitida</i> - -	Genuine Grey Bark -	8,406	1 8	to 2 9	
8	<i>C. Species</i> without name.	Fine Grey Bark -	2,745	1 8	to 2 10	
9	<i>C. micrantha</i> - -	Grey Bark - -	10,145	1 8	to 2 9	
10	<i>C. Peruviana</i> - -	Finest Grey Bark -	3,149	1 8	to 2 10	
11	<i>C. Pahudiana</i> - -	Unknown - -	425	Worthless.		
TOTAL Number of Plants - - -			291,607			

TABLE II.

MEMORANDUM of the Growth of Eleven Plants of *C. succirubra*, planted on the Second Denison Plantation, at Neddivuttum, on 30th August 1862.

Number of Plants.	Height in Inches when Planted on the 30th August 1862.	Height in Inches on the 31st December 1863.	Height in Inches on the 31st January 1864.	Growth in Inches during January 1864.	By whom Planted.
1	23	93	94	1	His Excellency Sir William Denison.
2	16½	86	86	0	
3	19	81	82	1	
4	15	86	87	1	
5	27	99	102	3	J. W. Breeks, Esq.
6	20	74	74	0	Dr. Sanderson.
7	20	90	91	1	J. D. Sim, Esq.
8	18	89	90	1	Lieutenant McLeod.
9	20	89	89	0	P. Grant, Esq.
10	20	94	96	2	Plant cut down for bark.
11	18	87	87	0	
12	0	21	28	7	

TABLE II. exhibits the growth of eleven plants planted out by His Excellency the Governor, and other gentlemen, at Neddivuttum, on the 30th August 1862. The average growth of these plants during the month is about 1 inch, or $\frac{1}{11}$ th inches below the growth of last month.

One of the two plants cut down on the 20th of March last, for the bark submitted to Mr. Howard for analysis, has been injured by the frost, the tender points and young leaves being destroyed. This plant was placed on the highest and coldest point of the Neddivuttum Plantation (elevation 6,200 feet). The other plant planted at the lowest point of the plantation (elevation 4,900 feet) has made strong shoots of 28 inches in height, giving an average growth during the month of 7 inches or 5 inches above the average growth of last month.

TABLE III.

SHOWING the Height of Twelve Plants of *C. officinalis*, planted on the Dodabetta Plantations at Ootacamund, on 30th September 1863.

Number of Plants.	Height in Inches when Planted on the 30th September 1863.	Height in Inches on the 31st December 1863.	Height in Inches on the 31st January 1864.	Growth in Inches during January 1864.	REMARKS.
1	19	28	31½	3½	The twelve plants of <i>Chinchona officinalis</i> (a shrubby species) on the Dodabetta Plantations gives an average growth of 3 inches during the month, or ½ inch above the growth of last month.
2	14½	22	25	3	
3	28	41	44½	3½	
4	22	30	38	3	
5	21½	29	31½	2½	
6	28	38	40½	2½	
7	22½	20½	32½	3	
8	21½	32½	35	2½	
9	21½	32	35½	3½	
10	19½	29	32½	3½	
11	24	31	34½	3½	
12	24	30	32½	2½	

TABLE IV.

MEMORANDUM of *Chinchona* Plants Distributed.

NAMES.	STATION.	Number of Plants.
Mr. F. N. Maltby -	Travancore -	16
Dr. Junghuhn -	Java -	56
Mr. A. R. Lascelles -	Ootacamund -	12
Mr. M. Anderson -	Jamaica -	2
Dr. Wiehe -	Bombay -	10
Dr. T. Anderson -	Calcutta -	554
Dr. Jamieson -	Saharanpore -	107
Professor Lees -	Calcutta -	61
Rajah of -	Travancore -	521
Major Morgan -	Ootacamund -	216
Mr. E. T. Fitzgerald -	Calcutta -	261
Mr. J. W. Money -	- ditto -	581
Dr. W. Bourne -	- ditto -	420
Captain Cox -	Wainad -	6
Mr. Hallock -	- ditto -	2
Mr. T. Sheffield -	Ootacamund -	2
Dr. F. Day -	Cochin -	100
Mr. Brown -	Tellicherry -	12
Mr. J. Hall -	Ootacamund -	144
Mr. J. Knop -	- ditto -	18
Captain Lees -	Bengal -	281
Mr. W. H. Rayne -	Manantoddy -	24
Reverend Sawyer -	Ootacamund -	18
Mr. Friend -	- ditto -	12
Mr. Hallock -	- ditto -	1
Mr. Perie -	Seegoor -	12
Colonel Scott -	Ootacamund -	212
Mr. F. Berend -	Cachar -	275
Reverend J. Hunter -	Coonoor -	12
Mr. J. Mullaly -	- ditto -	24
Mr. W. H. Stanes -	- ditto -	12
Colonel R. Cooper -	Kotagherry -	12
Mr. F. Cockburn -	- ditto -	12
Colonel Woodfall -	Coonoor -	12
Mr. C. Anderson -	- ditto -	24
Colonel Angelo -	Ootacamund -	12
Reverend E. Laseron -	- ditto -	12
Captain R. N. Taylor -	Coorg -	96
Major W. Agnew -	Assam -	139
Mr. V. H. Levinge -	Madura -	12
Chief Commissioner -	Nagpore -	28
Mr. Fletcher -	Ootacamund -	24
Gool Mahomed -	- ditto -	20

The number of plants issued to the public is 1,593, making the total number of plants distributed 9,125.

The cold and draught of this month has been unusually severe, and accompanied by high, parching winds, and the effect on the plants is very interesting and instructive. The *Chinchona Succirubra*, at elevations above 5,600 feet, have entirely ceased to grow, and assume the appearance of plants wintering, or in a state of rest; under this elevation there has been a slight growth, increasing gradually as the elevation descends, until (as noted above) the extraordinary growth of 7 inches has been attained at the lowest elevation. The same effect has also been observed in our Dodabetta Plantation, the lowest part of which is 7,830 feet elevation, and the highest point 8,300 feet. Upon this site, both at high and low elevations, the *C. succirubra* and *micrantha*, &c., have assumed an entire state of rest, but being planted in sheltered positions have not suffered from the frost. The highest and most exposed parts of this site

TABLE IV.—Memorandum of Chinchona Plants Distributed—*continued.*

NAMES.	STATION.	Number of Plants.	REMARKS.
General McCleverty - - -	New Zealand - - -	23	are entirely occupied by the <i>C. officinalis</i> , and its varieties; here the tender leaves and young shoots of a few of the plants have been injured by the frost; and the whole of the plants have assumed a state of rest, while at the lower elevation of 8,000 feet this hardy species begins to maintain its growth, until at 7,830 feet elevation the average growth of 8 inches has been attained.
Mr. W. Robinson - - -	Kotagherry - - -	6	
" Crake - - -	Wainad - - -	12	
" H. R. Dawson - - -	Seegoor - - -	12	
Captain Mann - - -	Coorg - - -	36	
Mr. E. Roberts - - -	Ootacamund - - -	6	
" H. Rossall - - -	Wainad - - -	12	
Rev. — Wait - - -	Coonoor - - -	2	
Mr. H. de Facien - - -	Katarry - - -	2,761	
Collector of - - -	Belgaum - - -	28	
Collector of - - -	Honore - - -	28	
Dr. Ross - - -	- ditto - - -	15	
His Excellency the Governor of - - -	Bombay - - -	158	
Mr. A. Hinde - - -	Wainad - - -	12	
" E. B. Thomas - - -	Coonoor - - -	12	
Rajah of - - -	Poonganoor - - -	12	
Dr. Bourne - - -	Calcutta - - -	112	
Messrs. Thomson, Shaw & Co. - - -	- ditto - - -	28	
Mr. T. H. Transon - - -	- ditto - - -	31	
Professor Lees - - -	- ditto - - -	486	
Dr. Mueller - - -	Melbourne - - -	28	
Mr. Tyrrell - - -	Mysore - - -	12	
Dr. Sayers - - -	Vellore - - -	12	
Mr. H. de Facien - - -	Katarry - - -	884	
TOTAL Number of Plants - - -		9,125	

Ootacamund,
10 February 1864.

(signed) *W. G. McIvor*,
Superintendent Government Chinchona Plantations.

— No. 19. —

From the Government of Madras to the Secretary of State for India.

Madras, 11 March 1864.

WE have the honour to forward for your information the accompanying Tabular Report on the number, condition, &c. of the Chinchona plants on the Neilgherries on the 29th February 1864.

Enclosure in No. 19:

REPORT on the Number, Distribution, and Condition of Chinchona Plants on the Neilgherries, on the 29th February 1864.

No. of Species.	Botanical Names.	Commercial Names.	Number of Plants.	Value per Lb. of Dry Bark in the London Market.		REMARKS.
				s. d.	s. d.	
1	<i>C. succirubra</i> - - -	Red Bark - - -	94,547	2 6	8 9	The number of plants permanently planted out remain as formerly, viz., 66,622.
2	<i>C. Calisaya</i> - - -	Yellow Bark - - -	1,841	2 10	7 -	
3	<i>C. officinalis</i> , var. <i>Condaminea</i> (<i>C. Uritusinga</i>). - - -	Original Loxa Bark - - -	6,744	2 10	7 -	
4	<i>C. officinalis</i> , var. <i>Bonplandiana</i> (<i>C. Chahuarguera</i>). - - -	Select Crown Bark - - -	1,92,339	2 10	7 -	The increase by propagation during the month is 82,408, being 13,864 plants above the average results of the last six months, making the total number of plants at the end of the month 3,22,315.
5	<i>C. crespilla</i> - - -	Fine Grey Bark - - -	1,620	2 10	6 -	
6	<i>C. lancifolia</i> - - -	Pitayo Bark - - -	6	1 8	2 10	
7	<i>C. nitida</i> - - -	Genuine Grey Bark - - -	8,419	1 8	2 9	
8	<i>C. Species without name.</i> - - -	Fine Bark - - -	2,760	1 8	2 10	
9	<i>C. micrantha</i> - - -	Grey Bark - - -	10,450	1 8	2 9	
10	<i>C. Peruviana</i> - - -	Finest Grey Bark - - -	3,164	1 8	2 10	
11	<i>C. Pahudiana</i> - - -	Unknown - - -	425	Worthless.		
TOTAL Number of Plants - - -			3,22,315			

TABLE II.

MEMORANDUM of the Growth of Eleven Plants of *C. succirubra*, planted on the Second Denison Plantation, at Neddivuttum, on the 30th August 1862.

Number of Plants.	Height in Inches when Planted, on 30 August 1862.	Height in Inches on 31 January 1864.	Height in Inches on 29 February 1864.	Growth in Inches during February 1864.	By whom Planted.	REMARKS.
1	23	94	94	0	His Excellency Sir W. Denison.	TABLE II. exhibits the growth of 11 plants planted out by his Excellency the Governor, and other gentlemen, at Neddivuttum, on the 30th August 1862. The average growth of these plants during the month is about $\frac{1}{2}$ inch, or $\frac{3}{4}$ inch under the average growth of last month.
2	16 $\frac{1}{2}$	86	87	1		
3	19	82	82	0		
4	15	87	87 $\frac{1}{2}$	$\frac{1}{2}$		
5	27	102	102 $\frac{1}{2}$	$\frac{1}{2}$		
6	20	74	74	0		
7	20	91	91	0		
8	16	90	90	0		
9	20	89	89	0		
10	20	96	97	1		
11	18	87	87	0		
12	0	28	30	2	J. W. Breeks, Esq. Dr. Sanderson. J. D. Sim, Esq. Lieutenant McLeod. P. Grant, Esq. Plant cut down for bark.	

TABLE III.

SHOWING the Height of Twelve Plants of *C. officinalis*, planted on the Dodabetta Plantations, at Ootacamund, on the 30th September 1863.

Number of Plants.	Height in Inches when Planted on 30 September 1863.	Height in Inches on 31 January 1864.	Height in Inches on 29 February 1864.	Growth in Inches during February 1864.	REMARKS.
1	19	31 $\frac{1}{2}$	34 $\frac{1}{2}$	3	One of the two plants (that uninjured by the frost) cut down on the 20th of March last, for the bark, submitted to Mr. Howard for analysis, has made strong shoots of 30 inches in height, giving an average growth during the month of two inches, or five inches under the growth of last month.
2	14 $\frac{1}{2}$	25	28	3	
3	28	44 $\frac{1}{2}$	46	1 $\frac{1}{2}$	
4	22	33	37	4	
5	21 $\frac{1}{2}$	31 $\frac{1}{2}$	35	3 $\frac{1}{2}$	
6	28	40 $\frac{1}{2}$	46	5 $\frac{1}{2}$	
7	22 $\frac{1}{2}$	32 $\frac{1}{2}$	35	2 $\frac{1}{2}$	
8	21 $\frac{1}{2}$	35	38	3	
9	21 $\frac{1}{2}$	35 $\frac{1}{2}$	40	4 $\frac{1}{2}$	
10	19 $\frac{1}{2}$	32 $\frac{1}{2}$	37	4 $\frac{1}{2}$	
11	24	34 $\frac{1}{2}$	38	3 $\frac{1}{2}$	
12	24	32 $\frac{1}{2}$	36	3 $\frac{1}{2}$	

TABLE IV.

MEMORANDUM of Chinchona Plants Distributed.

NAMES.	STATION.	Number of Plants.
Mr. F. N. Maltby - - - -	Travancore - - - -	16
Dr. Junghuhn - - - -	Java - - - -	56
Mr. A. R. Lascelles - - - -	Ootacamund - - - -	12
Mr. M. Anderson - - - -	Jamaica - - - -	2
Dr. Wiehe - - - -	Bombay - - - -	10
Dr. T. Anderson - - - -	Calcutta - - - -	554
Dr. Jamieson - - - -	Saharanpore - - - -	107
Professor Lees - - - -	Calcutta - - - -	547
Rajah of - - - -	Travancore - - - -	521
Major Morgan - - - -	Ootacamund - - - -	216
Mr. E. T. Fitzgerald - - - -	Calcutta - - - -	405
Mr. J. W. Money - - - -	- ditto - - - -	581
Dr. W. Bourne - - - -	- ditto - - - -	582
Captain Cox - - - -	Wainad - - - -	6
Mr. Hallock - - - -	- ditto - - - -	2
Mr. T. Sheffield - - - -	Ootacamund - - - -	12
Dr. F. Day - - - -	Cochin - - - -	100

The 12 plants of *Chinchona officinalis* (a shrubby species) on the Dodabetta Plantation, gives an average growth of 3 $\frac{1}{2}$ inches during the month, or $\frac{1}{2}$ an inch above the growth of last month.

The number of plants issued to the public is 1,700, making the total number of plants distributed 10,825.

The strong and dry winds which prevailed almost continuously throughout the month at Neddivuttum, has retarded the growth of the plants as effectually as the cold weather in January. The increase in temperature, however, which took place towards the end of the

TABLE IV.—MEMORANDUM of Chinchona Plants Distributed—*continued.*

NAMES.	STATION.	Number of Plants.	REMARKS.
Mr. Brown - - - - -	Tellicherry - - -	12	month has proved highly beneficial to our propagating operations.
Mr. J. Hall - - - - -	Ootacamund - - -	144	
Mr. J. Knop - - - - -	- ditto - - -	18	
Captain Lees - - - - -	Bengal - - -	281	
Mr. W. H. Rayne - - - - -	Manantoddy - - -	24	
Reverend — Sawyer - - - - -	Ootacamund - - -	18	
Mr. Frend - - - - -	- ditto - - -	12	
Mr. Hallock - - - - -	- ditto - - -	1	
Mr. J. Perie - - - - -	Seegoor - - -	12	
Colonel Scott - - - - -	Ootacamund - - -	212	
Mr. F. Berend - - - - -	Cachar - - -	275	
Rev. J. Hunter - - - - -	Coonoor - - -	12	
Mr. J. Mullaly - - - - -	- ditto - - -	24	
Mr. W. H. Stanes - - - - -	- ditto - - -	12	
Colonel R. Cooper - - - - -	Kotagherry - - -	12	
Mr. F. Cockburn - - - - -	- ditto - - -	12	
Colonel Woodfall - - - - -	Coonoor - - -	12	
Mr. C. Anderson - - - - -	- ditto - - -	24	
Colonel Angelo - - - - -	Ootacamund - - -	12	
Rev. E. Laseron - - - - -	- ditto - - -	12	
Capt. R. N. Taylor - - - - -	Coorg - - -	96	
Major W. Agnew - - - - -	Assam - - -	130	
Mr. V. H. Levinge - - - - -	Madura - - -	12	
Chief Commissioner - - - - -	Nagpore - - -	28	
Mr. Fletcher - - - - -	Ootacamund - - -	24	
Gool Mahomed - - - - -	- ditto - - -	20	
General McCleverty - - - - -	New Zealand - - -	23	
Mr. W. Robinson - - - - -	Kotagherry - - -	6	
Mr. Crane - - - - -	Wainad - - -	12	
Mr. H. R. Dawson - - - - -	Seegoor - - -	12	
Captain Mann - - - - -	Coorg - - -	48	
Mr. E. Roberts - - - - -	Ootacamund - - -	6	
Mr. H. Russall - - - - -	Wainad - - -	12	
Rev. — Wait - - - - -	Coonoor - - -	2	
Mr. H. de Faoien - - - - -	Katary - - -	6,189	
Collector of - - - - -	Belgaum - - -	28	
Collector of - - - - -	Honore - - -	28	
Dr. Ross - - - - -	- ditto - - -	15	
His Excellency the Governor of - - - - -	Bombay - - -	158	
Mr. A. Hinde - - - - -	Wainad - - -	12	
Mr. E. B. Thomas - - - - -	Coonoor - - -	12	
Rajah of - - - - -	Poonganoor - - -	12	
Messrs. Thomson, Shaw, & Co. - - - - -	- ditto - - -	28	
Mr. T. H. Trinson - - - - -	- ditto - - -	31	
Dr. Miller - - - - -	Melbourne - - -	28	
Mr. Tyrrell - - - - -	Mysore - - -	12	
Dr. Sayer - - - - -	Vellore - - -	12	
TOTAL Number of Plants - - -		10,825	

Ootacamund,
8 March 1864.

(signed) *W. G. McIvor,*
Superintendent Government Chinchona Plantations.

— No. 20. —

From the Government of Madras to the Secretary of State for India.

Madras, 13 April 1864.

We have the honour to forward for your information the accompanying tabular report on the number, condition, &c., of the Chinchona plants on the Neilgherries on the 31st March 1864.

Enclosure in No. 20.

REPORT on the Number, Distribution, and Condition of Chinchona Plants on the Neilgherries, on the 31st March 1864.

No. of Species.	Botanical Names.	Commercial Names.	Number of Plants.	Value per Lb. of Dry Bark in the London Market.		REMARKS.
				s. d.	s. d.	
1	<i>C. succirubra</i> - -	Red Bark - -	97,918	2 6	to 8 9	The number of plants permanently planted out remain as formerly, viz., 66,622. The increase by propagation during the month is 20,118, being 1,574 plants above the average of the last six months, making the total number of plants at the end of March, 3,41,865.
2	<i>C. Calisaya</i> - -	Yellow Bark - -	1,871	2 10	to 7 -	
3	<i>C. officinalis</i> , var. <i>Condaminea</i> (<i>C. Uritusinga</i>).	Original Loxa Bark -	6,592	2 10	to 7 -	
4	Ditto var. <i>Bonplandiana</i> (<i>C. Chahuar-guera</i>).	Select Crown Bark -	2,08,465	2 10	to 7 -	
5	<i>C. crespilla</i> - -	Fine Grey Bark - -	1,618	2 10	to 6 -	
6	<i>C. lancifolia</i> - -	Pitayo Bark - -	8	1 8	to 2 10	
7	<i>C. nitida</i> - -	Genuine Grey Bark -	8,419	1 8	to 2 9	
8	<i>C. Species without name</i> - -	Fine Bark - -	2,760	1 8	to 2 10	
9	<i>C. micrantha</i> - -	Grey Bark - -	10,627	1 8	to 2 9	
10	<i>C. Peruviana</i> - -	Finest Grey Bark -	3,164	1 8	to 2 10	
11	<i>C. Pahudiana</i> - -	Unknown - -	425	Worthless.		
TOTAL Number of Plants - -			3,41,865			

TABLE II.

MEMORANDUM of the Growth of Eleven Plants of *C. succirubra*, planted on the Second Denison Plantation, at Neddivuttum, on the 30th August 1862.

Number of Plants.	Height in Inches when Planted, on the 30th August 1862.	Height in Inches on the 29th February 1864.	Height in Inches on the 31st March 1864.	Growth in Inches during March 1864.	By whom Planted.
1	23	94	94	0	His Excellency Sir W. Denison.
2	14½	87	88	1	
3	19	82	85	3	
4	15	87½	87½	0	
5	27	102½	102½	0	
6	20	74	75	1	J. W. Breeks, Esq. Dr. Sanderson. J. D. Sim, Esq. Lieutenant McLeod. P. Grant, Esq. Plant cut down for bark.
7	20	91	93	2	
8	18	90	91	1	
9	20	89	91	2	
10	20	97	98	1	
11	18	87	88	1	
12	0	30	30	0	

TABLE II. exhibits the growth of eleven plants of *C. succirubra* planted out by his Excellency the Governor and other gentlemen at Neddivuttum, on the 30th August 1862. The average growth of these plants during the month is 1¼ inches, or about ¼ of an inch above the average growth of last month.

One of the two plants cut down on the 20th of March last, for the bark, submitted to Mr. Howard for analysis, has made strong shoots of 30 inches in height.

TABLE III.

SHOWING the Height of Twelve Plants of *C. officinalis*, planted on the Dodabetta Plantation, at Ootacamund, on the 30th September 1863.

Number of Plants.	Height in Inches when Planted on the 30th September 1863.	Height in Inches on the 29th February 1864.	Height in Inches on the 31st March 1864.	Growth in Inches during the Month.	REMARKS.
1	19	34½	38	3½	The 12 plants of <i>Chinchona officinalis</i> (a shrubby species) on the Dodabetta Plantation gives an average growth of 3½ inches, or the same as last month.
2	14½	28	30½	2½	
3	28	46	48½	2½	
4	22	37	40½	8½	
5	21½	35	37½	2½	
6	28	46	48	2	
7	22½	35	39	4	
8	21½	38	42	4	
9	21½	40	44	4	
10	19½	37	42	5	
11	24	48	42	4	
12	24	36	40½	4½	

TABLE IV.
REGISTER of Chichona Plants distributed.

NAMES.	STATIONS.	Number of Plants.	REMARKS.
Mr. F. N. Maltby -	Travancore -	16	The number of plants issued to the public is 568, making the total number of plants distributed 11,393. The drought being unusually severe, it was found necessary about the middle of the month, to water the plants by hand, a tedious and expensive operation, which, fortunately, it was not necessary to continue for any length of time, as fine showers fell on the 30th and 31st. The dry season just passed, has been the most severe experienced for 15 years; not a drop of rain having fallen between the 8th December and 30th March.
Dr. Jungluhn -	Java -	56	
Mr. A. R. Lascelles	Ootacamund -	12	
„ M. Anderson -	Jamaica -	2	
Dr. Wiehe -	Bombay -	10	
Dr. T. Anderson -	Calcutta -	554	
„ Jamieson -	Saharanpore -	107	
Professor Lees -	Calcutta -	547	
Rajah of	Travancore -	521	
Major Morgan -	Ootacamund -	216	
Mr. E. T. Fitzgerald	Calcutta -	405	
Mr. J. W. Money -	- ditto -	581	
Dr. W. Bourne -	- ditto -	532	
Captain Cox -	Wainad -	6	
Mr. Hallock -	- ditto -	2	
„ T. Sheffield -	Ootacamund -	12	
„ F. Day -	Cochin -	100	
„ Brown -	Tellicherry -	12	
„ J. Hall -	Ootacamund -	144	
„ J. Knop -	- ditto -	18	
Captain Lees -	Bengal -	281	
Mr. W. H. Rayne -	Manantoddy -	24	
Rev. Sawyer -	Ootacamund -	18	
Mr. Friend -	- ditto -	12	
„ Hallock -	- ditto -	1	
„ J. Perie -	Seegoor -	12	
Colonel Scott -	Ootacamund -	724	
Mr. F. Berend -	Cachar -	275	
Rev. J. Hunter -	Coonoor -	12	
Mr. J. Mullaly -	- ditto -	24	
„ W. H. Stanes -	- ditto -	12	
Colonel R. Cooper -	Kotagherry -	12	
Mr. F. Cockburn -	- ditto -	12	
Colonel Woodfall -	Coonoor -	12	
Mr. C. Anderson -	- ditto -	24	
Colonel Angelo -	Ootacamund -	12	
Rev. E. Laseron -	- ditto -	12	
Captain R. N. Taylor	Coorg -	96	
Major W. Agnew -	Assam -	139	
Mr. V. H. Levigno -	Madura -	12	
Chief Commissioner	Nagpore -	28	
Mr. Fletcher -	Ootacamund -	24	
Gool Mahomed -	- ditto -	20	
General McCleverty	New Zealand	23	
Mr. W. Robinson -	Kotagherry -	6	
„ Crake -	Wainad -	12	
„ H. R. Dawson -	Seegoor -	12	
Captain Mann -	Coorg -	48	
Mr. E. Roberts -	Ootacamund -	6	
„ H. Russell -	Wainad -	12	
Rev. Wait -	Coonoor -	2	
Mr. H. de Facien -	Katary -	5,189	
Collector of Belgaum	Belgaum -	28	
Collector of Honore	Honore -	28	
Dr. Ross -	- ditto -	15	
His Excellency the Governor of	Bombay -	158	
Mr. H. Hinde -	Wainad -	12	
„ E. B. Thomas -	Coonoor -	12	
Rajah of Poonganoor	Poonganoor -	12	
Messrs. Thomson, Shaw & Co.	- ditto -	28	
Mr. J. H. Trinson -	- ditto -	31	
Dr. Muller -	Melbourne -	28	
Mr. Tyrnell -	Mysore -	12	
Dr. Savers -	Yellore -	12	
Major Taylor -	Ootacamund -	50	
Dr. Wilson -	- ditto -	6	
Total Number of Plants -		11,393	

Ootacamund,
8 April 1864.
353.

(signed) W. G. McIvor,
Superintendent Government Chichona Plantations.
F

— No. 21. —

From the Government of Madras to the Secretary of State for India.

Madras, 19 May 1864.

We have the honour to forward for your information the accompanying Tabular Report on the Number, Condition, &c., of the Chinchona Plants on the Neilgherries on the 30th April 1864.

Enclosure in No. 21.

REPORT on the Number, Distribution, and Condition of Chinchona Plants on the Neilgherries, on 30 April 1864.

Species.	Botanical Names.	Commercial Names.	Number of Plants.	Value per lb. of Dry Bark in the London Market.		REMARKS.
				s. d.	s. d.	
1	<i>C. succirubra</i> - -	Red Bark - -	91,046	2 6	to 8 9	<p>The weather being favourable, planting operations have been commenced, the number of plants planted out on the plantations during the month is 52,800, making the total 118,922.</p> <p>The increase by propagation is 28,988, being 9,737 plants above the average of the last six months, making the total number of plants at the end of the month 351,125.</p>
2	<i>C. Calisaya</i> - -	Yellow Bark - -	1,998	2 10	to 7 -	
3	<i>C. officinalis</i> , var. <i>Condaminea</i> (<i>C. Uritusinga</i>).	Original Loxa Bark	3,448	2 10	to 7 -	
4	<i>Do.</i> var. <i>Bonplandiana</i> (<i>C. Chahuarguera</i>).	Select Brown Bark -	227,195	2 10	to 7 -	
5	<i>C. crespilla</i> - -	Fine Grey Bark - -	1,728	2 10	to 6 -	
6	<i>C. lancifolia</i> - -	Pitayo Bark - -	8	1 8	to 2 10	
7	<i>C. nitida</i> - -	Genuine Grey Bark	8,425	1 8	to 2 9	
8	<i>C. Species</i> without name.	Fine Bark - -	2,769	1 8	to 2 10	
9	<i>C. micrantha</i> - -	Grey Bark - -	10,913	1 8	to 2 9	
10	<i>C. Peruviana</i> - -	Finest Grey Bark -	3,175	1 8	to 2 10	
11	<i>C. Pahudiana</i> - -	Unknown - -	425	Unknown.		
TOTAL Number of Plants - - -			351,125			

TABLE II.

MEMORANDUM of the Growth of Eleven Plants of *C. succirubra*, planted on the Second Denison Plantation, at Neddivuttum, on 30 August 1862.

Number of Plants.	Height in Inches when Planted, 30 August 1862.	Height in Inches on 31 March 1864.	Height in inches on 30 April 1864.	Growth in Inches during April 1864.	By Whom Planted.
1	23	94	97	3	His Excellency Sir W. Denison.
2	16½	88	89	1	
3	19	85	85½	0½	
4	15	87½	88½	0½	
5	27	102½	104	1½	
6	20	75	76	1	J. W. Brecks, Esq. Dr. Sanderson. J. D. Sim, Esq. Lieutenant McLeod. P. Grant, Esq. Plant cut down for bark.
7	20	93	95	2	
8	18	91	92	1	
9	20	91	92	1	
10	20	98	100	2	
11	18	80	88½	0½	
12	0	30	31½	1½	

TABLE II. exhibits the growth of eleven plants of *C. succirubra*, planted out by His Excellency the Governor and other gentlemen at Neddivuttum, on the 30th August 1862. The average growth of these plants during the month is about 1½ inches, or the same as last month.

One of the two plants cut down on the 20th of March 1863 for the bark, submitted to Mr. Howard for analysis, has made strong shoots of 31½ inches in height, giving the growth of 1½ inches during the month.

TABLE III

SHOWING the Height of Twelve Plants of *C. officinalis*, planted on the Dodabetta Plantation at Ootacamund on 30 September 1863.

Number of Plants.	Height in Inches when Planted, on 30 September 1863.	Height in Inches on 31 March 1864.	Height in Inches on 30 April 1864.	Growth in Inches during April 1864.	REMARKS.
1	19	38	41½	3½	The 12 plants of <i>Chinchona officinalis</i> (a shrubby species) on the Dodabetta plantation gives an average growth of 3½ inches, or the same as last month.
2	14½	30½	34	3½	
3	28	48½	51	2½	
4	22	40½	44	3½	
5	21½	37½	40½	3	
6	28	48	51	3	
7	22½	39	43	4	
8	21½	42	45½	3½	
9	21½	44	47½	3½	
10	19½	42	46½	4½	
11	24	42	46	4	
12	24	40½	44½	4	

TABLE IV.

REGISTER of Chinchona Plants Distributed.

NAMES.	STATION.	Number of Plants.
Mr. F. N. Maltby	Travancore	16
Dr. Junghun	Java	56
Mr. A. R. Lascelles	Ootacamund	12
Mr. M. Anderson	Jamaica	2
Dr. Wiehe	Bombay	10
Dr. T. Anderson	Calcutta	554
Dr. Jamieson	Saharanpore	107
Professor Lees	Calcutta	547
Rajah of Travancore	Travancore	521
Major Morgan	Ootacamund	1,594
Mr. E. T. Fitzgerald	Calcutta	405
Mr. J. W. Money	ditto	581
Dr. W. Bourne	ditto	592
Captain Cox	Wainad	6
Mr. Hallock	ditto	2
Mr. T. Sheffield	Ootacamund	12
Dr. F. Day	Cochin	100
Mr. Brown	Tillicherry	12
Mr. J. Hall	Ootacamund	144
Mr. J. Knop	ditto	18
Captain Lees	Bengal	281
Mr. W. H. Rayne	Manantoddy	24
Reverend Sawyer	Ootacamund	18
Mr. Friend	ditto	12
Mr. Hallock	ditto	1
Mr. J. Perie	Seegoor	12
Colonel Scott	Ootacamund	724
Mr. F. Berend	Cachar	275
Rev. J. Hunter	Coonoor	12
Mr. J. Mullaly	ditto	24
Mr. W. H. Stanes	ditto	12
Colonel R. Cooper	Kotagherry	12
Mr. F. Cockburn	ditto	12
Colonel Woodfall	Coonoor	12
Mr. C. Anderson	ditto	24
Colonel Angelo	Ootacamund	12
Rev. E. Laseron	ditto	12
Captain R. N. Taylor	Coorg	96
Major W. Agnew	Assam	139
Mr. V. H. Levinge	Madura	12
Chief Commissioner of Nagpore	Nagpore	28
Mr. Fletcher	Ootacamund	24
Gool Mahomed	ditto	20
General McCleverty	New Zealand	23
Mr. W. Robinson	Kotagherry	18
Mr. Crake	Wainad	12

The number of plants issued to the public is 19,730, making the total number of plants distributed 31,123.

TABLE IV.—MEMORANDUM Chinchona Plants distributed, &c.—continued.

NAMES.	STATION.	Number of Plants.	REMARKS.
Mr. H. R. Dawson	Seegoor	12	
Captain Mann	Coorg	48	
Mr. E. Roberts	Ootacamund	6	
„ H. Russell	Wainad	12	
Rey. Wait	Coonoor	2	
Mr. H. de Facien	Katary	5,189	
Collector of Belgaum	Belgaum	28	
Collector of Honore	Honore	28	
Dr. Ross	ditto	15	
His Excellency the Governor of Bombay.	Bombay	158	
Mr. A. Hinde	Wainad	12	
„ E. B. Thomas	Coonoor	12	
Rajah of Poonganoor	Poonganoor	12	
Messrs. Thomson, Shaw, & Co.	ditto	28	
Mr. T. H. Trimson	ditto	31	
Dr. Miller	Melbourne	28	
Mr. Tyrrell	Mysore	12	
Dr. Sayers	Vellore	1,012	
Mr. Drummond	Ootacamund	224	
Major J. P. Taylor	ditto	2,198	
Dr. Wilson	ditto	6	
Captain Fuller	Coonoor	28	
Mr. Schnarie	Ootacamund	15,000	
TOTAL number of Plants		31,123	

Ootacamund,
12 May 1864.

(signed) *W. G. McIvor*,
Superintendent Government Chinchona Plantations.

— No. 22. —

From the Government of Madras to the Secretary of State for India.

Madras, 14 June 1864.

WE have the honour to forward for your information the accompanying Tabular Report on the number, condition, &c., of the Chinchona plants on the Neilgherries on the 31 May 1864.

Enclosure in No. 22.

REPORT on the Number, Distribution, and Condition of Chinchona Plants on the Neilgherries on 31 May 1864.

No. of Species.	Botanical Names.	Commercial Names.	Number of Plants.	Value per lb. of Dry Bark in the London Market.		REMARKS.
				s. d.	s. d.	
1	<i>C. succirubra</i>	Red Bark	102,344	2 6	to 8 9	The number of plants planted out on the plantations during the month is 25,394; making the total 144,316 plants permanently planted out.
2	<i>C. Callsaya</i>	Yellow Bark	2,137	2 10	to 7 -	
3	<i>C. officinalis</i> , var. <i>Condaminea</i> (<i>C. Uritusinga</i>).	Original Loxa Bark	4,494	2 10	to 7 -	
4	<i>C. officinalis</i> , var. <i>Bonplandiana</i> (<i>C. Chahuarguera</i>).	Select Crown Bark	232,980	2 10	to 7 -	The increase by propagation is 19,661, being 1,939 plants under the average of the last six months. The total number of plants at the end of the month being 385,247.
5	<i>C. crespilla</i>	Fine Grey Bark	1,927	2 10	to 6 -	
6	<i>C. lancifolia</i>	Pitayo Bark	12	1 8	to 10 -	
7	<i>C. nitida</i>	Genuine Grey Bark	8,426	1 8	to 9 -	
8	<i>C. Species without name.</i>	Fine Bark	2,769	1 8	to 10 -	
9	<i>C. micrantha</i>	Grey Bark	11,561	1 8	to 9 -	
10	<i>C. Peruviana</i>	Finest Grey Bark	3,176	1 8	to 10 -	
11	<i>C. Pahudiana</i>	Unknown	425	Unknown.		
TOTAL Number of Plants			385,247			

TABLE II.

MEMORANDUM of the Growth of Eleven Plants of *C. Succirubra*, planted on the 2d Denison Plantation, at Neddivuttum, on 30 August 1862.

Number of Plants.	Height in Inches when Planted on 30 August 1862.	Height in Inches on 30 April 1864.	Height in Inches on 31 May 1864.	Growth in Inches during May 1864.	By whom Planted.	REMARKS.
1	23	97	98	2	His Excellency Sir W. Denison.	TABLE II. exhibits the growth of eleven plants of <i>Chinchona succirubra</i> planted out by his Excellency the Governor and other gentlemen at Neddivuttum on the 30th August 1862. The average growth of these plants during the month is $1\frac{5}{7}$ inches or about $\frac{1}{2}$ inch above the growth of last month. One of the plants cut down on the 20th of March 1863 for the bark submitted to Mr. Howard for analysis, has made strong shoots of 35 inches in height, giving the growth of $4\frac{1}{2}$ inches during the month, or three inches above the growth of last month.
2	18 $\frac{1}{2}$	89	90	2		
3	19	85 $\frac{1}{2}$	87	1		
4	16	88 $\frac{1}{2}$	91 $\frac{1}{2}$	1 $\frac{1}{2}$		
5	27	104	106	3		
6	20	76	78	1		
7	20	95	96	1		
8	18	92	93	1		
9	20	92	94	2		
10	20	100	101	1		
11	18	88 $\frac{1}{2}$	89	0 $\frac{1}{2}$		
12	0	31 $\frac{1}{2}$	35	4 $\frac{1}{2}$	J. W. Bree Esq. Dr. Sanderson. J. D. Sim. Esq. Lieutenant McLeod. P. Grant, Esq. Plant cut down for bark	

TABLE III.

SHOWING the Height of Twelve Plants of *C. officinalis* planted on the Dodabetta Plantation at Ootacamund on 30 September 1863.

Number of Plants.	Height in Inches when Planted on 30 September 1863.	Height in Inches on 30 April 1864.	Height in Inches on 31 May 1864.	Growth in Inches during May 1864.	REMARKS.
1	19	41 $\frac{1}{2}$	44	2 $\frac{1}{2}$	The twelve plants of <i>C. officinalis</i> (a shrubby species) on the Dodabetta plantation gives an average growth of $3\frac{1}{2}$ inches, or the same as last month.
2	14 $\frac{1}{2}$	34	37 $\frac{1}{2}$	3 $\frac{1}{2}$	
3	28	51	54	3	
4	22	44	49	5	
5	21 $\frac{1}{2}$	40 $\frac{1}{2}$	44	3 $\frac{1}{2}$	
6	29	51	54	3	
7	22 $\frac{1}{2}$	43	46 $\frac{1}{2}$	3 $\frac{1}{2}$	
8	21 $\frac{1}{2}$	45 $\frac{1}{2}$	48 $\frac{1}{2}$	3	
9	21 $\frac{1}{2}$	47 $\frac{1}{2}$	52 $\frac{1}{2}$	5	
10	19 $\frac{1}{2}$	46 $\frac{1}{2}$	50	3 $\frac{1}{2}$	
11	24	46	50	4	
12	24 $\frac{1}{2}$	44	47 $\frac{1}{2}$	3	

TABLE IV.

REGISTER of Chinchona Plants Distributed.

NAMES.	STATION.	No. of Plants.
Mr. F. N. Maltby	Travancore	16
Dr. Junghun	Java	56
Mr. A. R. Lascelles	Ootacamund	12
Mr. M. Anderson	Jamaica	2
Dr. Wiehe	Bombay	10
Dr. T. Anderson	Calcutta	554
Dr. Jamieson	Saharapore	107
Professor Lees	Calcutta	547
Rajah of Travancore	Travancore	521
Major Morgan	Ootacamund	1,534
Mr. E. T. Fitzgerald	Calcutta	405
Mr. J. W. Money	ditto	581
Dr. W. Bourne	ditto	532
Captain Cox	Wainad	6

TABLE IV.—Register of Chinchona Plants Distributed—*continued.*

NAMES.	STATION.	Number of Plants.	REMARKS.
Mr. Hallock - - - -	Wainad - - - -	2	The number of plants issued to the public is 539, making the total number of plants distributed 31,662.
Mr. T. Sheffield - - - -	Ootacamund - - - -	12	
Dr. F. Day - - - -	Cochin - - - -	100	
Mr. Brown - - - -	Tellicherry - - - -	12	
Mr. J. Hall - - - -	Ootacamund - - - -	144	
Mr. J. Knop - - - -	- ditto - - - -	18	
Captain Lees - - - -	Bengal - - - -	281	
Mr. W. H. Rayne - - - -	Manantoddy - - - -	24	
Rev. — Sawyer - - - -	Ootacamund - - - -	1,018	
Mr. Frend - - - -	- ditto - - - -	12	
Mr. Hallock - - - -	- ditto - - - -	1	
Mr. J. Perie - - - -	Seegoor - - - -	12	
Colonel Scott - - - -	Ootacamund - - - -	1,024	
Mr. F. Berend - - - -	Cachar - - - -	275	
Rev. J. Hunter - - - -	Coonoor - - - -	12	
Mr. J. Mullaly - - - -	- ditto - - - -	24	
Mr. W. H. Stanes - - - -	- ditto - - - -	12	
Colonel R. Cooper - - - -	Kotagherry - - - -	12	
Mr. F. Cockburn - - - -	- ditto - - - -	12	
Colonel Woodfall - - - -	Coonoor - - - -	12	
Mr. C. Anderson - - - -	- ditto - - - -	24	
Colonel Angelo - - - -	Ootacamund - - - -	12	
Rev. E. Laseron - - - -	- ditto - - - -	12	
Captain R. N. Taylor - - - -	Coorg - - - -	96	
Major W. Agnew - - - -	Assam - - - -	139	
Mr. V. H. Levinge - - - -	Madura - - - -	12	
Chief Commissioner - - - -	Nagpore - - - -	28	
Mr. Fletcher - - - -	Ootacamund - - - -	24	
Gool Mahomed - - - -	- ditto - - - -	20	
General McCleverty - - - -	New Zealand - - - -	23	
Mr. W. Robinson - - - -	Kotagherry - - - -	18	
Mr. Crake - - - -	Wainad - - - -	12	
Mr. H. R. Dawson - - - -	Seegoor - - - -	12	
Captain Mann - - - -	Coorg - - - -	48	
Mr. E. Roberts - - - -	Ootacamund - - - -	6	
Mr. H. Russell - - - -	Wainad - - - -	12	
Rev. — Wait - - - -	Coonoor - - - -	2	
Mr. H. de Facien - - - -	Katary - - - -	5,189	
Collector of - - - -	Belgaum - - - -	28	
Collector of - - - -	Honore - - - -	28	
Dr. Ross - - - -	- ditto - - - -	15	
His Excellency the Governor of - - - -	Bombay - - - -	158	
Mr. H. Hinde - - - -	Wainad - - - -	12	
Mr. E. B. Thomas - - - -	Coonoor - - - -	12	
Rajah of Poonganoor - - - -	Poonganoor - - - -	12	
Messrs. Thomson, Shaw & Co. - - - -	- ditto - - - -	28	
Mr. J. H. Trinson - - - -	- ditto - - - -	31	
Dr. Muller - - - -	Melbourne - - - -	28	
Mr. Tyrrell - - - -	Mysore - - - -	12	
Dr. Sayers - - - -	Vellore - - - -	12	
Major Taylor - - - -	Ootacamund - - - -	2,198	
Doctor Wilson - - - -	- ditto - - - -	6	
Mr. Schnarie - - - -	- ditto - - - -	15,000	
Captain Fuller - - - -	Coonoor - - - -	28	
Mr. Drummond - - - -	Ootacamund - - - -	224	
Captain Jennings - - - -	- ditto - - - -	200	
Lieut. H. B. Montmorency - - - -	Bangalore - - - -	6	
Mr. McHutchin - - - -	Ootacamund - - - -	8	
Colonel Molesworth - - - -	- ditto - - - -	6	
Mr. C. Gray - - - -	Coonoor - - - -	12	
Mr. H. B. Liddell - - - -	Ootacamund - - - -	12	
TOTAL Number of Plants - - - -		31,622	

Ootacamund,
9 June 1864.

(signed) *W. G. McIvor,*
Superintendent Government Chinchona Plantations.

— No. 23. —

From Sir *Charles Wood* to The Government of Madras.

India Office, 8 August 1864.

Dated—
 11 Jan. 1864.
 23 Feb. "
 11 Mar. "
 13 April "
 19 May "
 14 June "

1. I HAVE considered in Council your letters in the Revenue Department, noted in the margin, reporting the progress of Chinchona cultivation on the Neilgherry Hills, and forwarding a box of Chinchona bark and leaves for analysis.

2. The exceptionally severe drought of the recent dry season has been a searching test of the suitability of the Neilgherry climate for the cultivation of Chinchona plants, and the way in which they have passed through this ordeal, while many coffee planters have sustained considerable losses, is very satisfactory. There can now be no doubt that the Chinchona plants have found on the Neilgherry hills a climate which is well adapted for their profitable cultivation.

3. Mr. Howard's report of his analysis of the third remittance of bark from India is encouraging, and establishes the fact that cultivation will improve the produce of febrifuge alkaloids in Chinchona plants. That eminent chemist recommends that the bark should be sent in its natural state for sale in the London market, and that no attempt should be made in India to reduce its bulk. But this suggestion, including the suggestion contained in your letter, dated August 12th (No. 80), 1863, calls for further very careful consideration, and will be discussed in a future Despatch.

4. I herewith transmit copies of the following papers for the use of Mr. McIvor and others who are interested in Chinchona cultivation:—

25 copies of Mr. Howard's Report of an analysis of the third remittance of bark from India;

10 copies of the Reports for 1860 and 1861, respecting the condition of quinine cultivation in Java, by Dr. Junghuhn, translated from the Dutch, with some explanatory notes by Mr. Markham; and

10 copies of a preliminary guide to the cultivation of quinine, by Dr. Junghuhn, translated from the Dutch.

— No. 24. —

From *W. G. McIvor*, Esq., Superintendent, Government Chinchona Plantations, to the Secretary to Government, Fort St. George.

Sir,

Ootacamund, 17 March 1864.

1. I HAVE the honour to forward by banghy a box containing a further supply of Chinchona bark and leaves, as per list annexed, for transmission to the Right Honourable the Secretary of State for India, in order that they may be submitted to Mr. Howard for analysis and report.

2. The bark and leaves now forwarded were removed from the plants on the 24th of February last, being the dry season of the year, or the period when they are at rest, notwithstanding, the bark was found to separate freely from the stems; therefore, if these specimens are found to contain a larger percentage of alkaloid than those previously submitted, this will, no doubt, be the most favourable season of the year for peeling and drying the bark.

3. Further observation seems to establish that the plants will give a fair yield of bark annually from lopping and pruning on the principle suggested in my letter of the 4th June 1861. In accordance with this system of pruning, I removed two of the lower branches from a plant of *Chinchona succirubra* two years and five months old. The bark of these branches form specimens Nos. 1 and 2, and give a total weight of 21½ tolas, or about 8½ ounces of dry bark. I expect that No. 1 will be valuable; No. 2 is from the very small succulent branches, consequently its yield in alkaloid may not be of sufficient value to pay

the cost of preparation and transport. I am anxious that Mr. Howard should give the probable market value of these two samples of bark, in order to enable us to form an approximate estimate of the yearly returns from loppings and prunings, as I feel convinced that this will be our principal source of revenue, at least for many years to come, especially as the system tried experimentally of removing strips of bark from the stems of the plants has been found to injure their growth, and therefore cannot be profitably practised.

Chinchona succirubra.

No. 1. Bark from the thickest part of two lower branches of a plant of *C. succirubra* two years and five months old. This bark when fresh, *i. e.*, immediately after being removed from the branches, weighed 37 tolas; * one hour's drying reduced the weights to 32 tolas, and when perfectly dry it was found to have decreased in weight to 12½ tolas, giving a loss of about two-thirds in drying.

No. 2. Bark from the spray or small portions of the same branches as No. 1. This bark when fresh weighed 40 tolas or 1 lb., in one hour's drying its weight was reduced to 31 tolas, and when thoroughly dry to 9½ tolas, making the loss of weight in drying fully three-fourths.

No. 3. Bark from the stems of *C. succirubra* from plants of 16 months' growth, weighing 18½ tolas of dry bark.

No. 4. Bark from the small branches of the same plants as No. 3, weighing 12½ tolas of dry bark.

No. 5. Dry leaves of *C. succirubra*.

No. 6. Specimens of the wood of *C. succirubra* from which strips of bark had been previously removed, showing the injury done to the stem by this process.

(signed) *W. G. McIvor*,
Superintendent Government Chinchona Plantation.

From *W. G. McIvor*, Esq., Superintendent Government Chinchona Plantations, to *J. D. Sim*, Esq., Secretary to Government, Revenue Department, Fort St. George.

Sir,

Ootacamund, 19 March 1864.

IN continuation of my letter of the 17th instant, I have the honour to inform you that I have this day forwarded by banghy a portion of the bark belonging to sample No. 3, which unfortunately by an oversight was omitted to be packed; this makes the total weight of dry bark of No. 3 specimen 33 tolas, *viz.*, 18½ tolas previously forwarded, and 14½ tolas now submitted; and will feel obliged by your having the goodness to correct the list accordingly.

— No. 25. —

REPORT of an Analysis of the Third Remittance† of Bark from India.

From *J. E. Howard*, Esq., to the Under Secretary of State for India.

Sir,

15 June 1864.

I HAVE the honour to report that I received, on the 20th May, the specimens mentioned by Mr. McIvor in his Despatch of 17th March last, and that the same were all in good condition.

I have

* Note.—40 tolas make 1 English pound, and consequently 2½ tolas = 1 ounce.
† The first remittance was received in the spring of 1863, and the second in October 1863.

I have since devoted most careful attention to ascertain by experiment the probable market value, especially of the first two samples of bark sent. It will not be necessary for me to detail the various means by which I succeeded in convincing myself, not only of the existence of the alkaloids, but of their being extant in such a state of purity as is certainly not found in the ordinary samples of red bark imported from South America. The result of my examination tended to show distinctly, that cultivation has improved the produce of at least this species of Chinchona.*

I must remark that the commercial value of specimens of bark intended for the manufacturers of sulphate of quinine can never be ascertained by the mere knowledge of the per-centage of alkaloid soluble in ether, since it is necessary that this should be shown to exist in such a state as to crystallize with acids into the required compounds.

In the case of No. 1, the bark from the thickest part of the lower branches of a *C. succirubra*, two years and five months old, this examination was most satisfactory, confirming that which I stated in my first report as to the facility with which the alkaloids were obtained in a state of purity, although the amount of red colouring matter in the bark is very great. The amount of purified alkaloids I estimate at 6 per cent., consisting of quinine 3·14, chinchonidine 2·06,† chinchonine 0·80. This large product of alkaloids might probably be still further increased by surrounding the stem with moss, in the manner which Mr. McIvor has so happily suggested, since Dr. De Vry found 8·409 per cent. of alkaloids in a stem which had been so treated. It seems to me, from this trial, that the East Indian bark, the produce of *C. succirubra*, will rival in price the Bolivian *Calisaya*, which is by no means the case with the bark of the branches of the *C. succirubra* as grown in South America. It is important to remark, that the very high price of between 8 s. and 9 s., which has quite recently been paid for red bark in this market, applies only to those pieces of bark from the trunk of the tree which possess, from their age, a peculiar bright red appearance.‡ I have forwarded a small vial with commercial sulphate of quinine obtained from this No. 1, as also sulphate of chinchonidine separate from the above. I have only to remark further on this bark, that its appearance bespeaks its good quality, and that there can be no doubt the season chosen (24th of February) is most favourable to its being well secured.

Of No. 2 I cannot speak so favourably. This consists of the very minute bark from the spray or small portions of the same branches as No. 1. From this I did not succeed in obtaining more than 0·9 per cent. of impure alkaloid, which lost one-half in the attempt to purify, since the alkaloids are much implicated with tannin (apparently), and not capable of easy crystallization. I would suggest that the best destination for the bark of these small branches might probably be to sell it to the druggist for pharmaceutical preparations, for which purpose it is well adapted, as being quite equal to mu b that is brought from Peru for this purpose. I do not think that it could be considered worth any price for manufacturing purposes.

No. 3. Bark from plants of *C. succirubra* of 16 months' growth yielded me not quite 3 per cent. of alkaloid, which I estimate as follows:—quinine and chinchonidine 2·45, chinchonine 0·52; total 2·97 per cent.

The consideration of this specimen forcibly suggests the desirability of giving the bark as long a time as possible to mature, since the additional 13 months of No. 1 specimen have much more than doubled the commercial value of the bark, the proportion of quinine, which could be easily obtained crystallized as sulphate, being about one-third of No. 1 specimen.

No. 4 resembles No. 2. I may remark that I find the alkaloid (or alkaloids) in the leaves in a highly exceptional and, I suppose, transitional state, and one rapidly passing under the influence of the oxygen of the air into that of the quinoidine of commerce. The young shoots appear to contain the alkaloids in a more mature condition than the leaves, but still somewhat intermediate between these and the larger branches. The amount of alkaloid 1·10 per cent., of which soluble in ether 0·51. The remainder consisted of alkaloid precipitated by ammonia

* The same does not seem to hold good of the *C. Calisaya* in Java.

† Forming a resinous hydriodate.

‡ The bark of the branches of the same parcel did not produce 2·6.

monia in union apparently with oxydized tannin, which separated on solution of the alkaloid in spirits of wine. It is obvious that further research on larger quantities of bark and leaves is needed to elucidate the difficult and interesting problems which arise in connexion with the question how the alkaloids are built up in the plant itself.

I have been asked by Mr. Markham to give an opinion "whether, even if the difficulties in the way of carrying on delicate chemical processes might prevent success in obtaining pure commercial quinine in India, yet still a rough substance might not be produced which would be efficacious as a febrifuge, and which might also be imported into Europe for the manufacture of quinine, instead of sending home many times the bulk and weight of bark." My reply is, that experience has hitherto shown, by the failure of the very numerous attempts in this direction, that the collectors and importers reap in the end more profit from sending in to the European market the raw material than the half manufactured product. This latter would command no price worth mentioning as a febrifuge *per se*. It would simply come into competition with the quinoidine and refuse product of the bark operation. As to the reasons why it is not profitable to bring the product into a smaller bulk for facility of transport, they depend in part on the complexity of the organic constituents of the barks, leading (especially under the influence of lime or alkalis) to deteriorating changes in the alkaloids, and partly also to the tendency of the heat to which the product must be subjected operating in the same direction. If I had a bark plantation in India, I should unquestionably order the bark sent home, even if I had skilful and experienced workmen to whom the task could be safely confided in India of attempting to reduce the cost of transport.

I have, &c.
(signed) *John Eliot Howard.*

— No. 26. —

From Mr. *Merivale* to Mr. *Howard*.

Sir,

India Office, 18 August 1864.

I AM desired by Sir Charles Wood to acknowledge the receipt of your report of an analysis of the third remittance of Chinchona bark, from the Neilgherry Hills, copies of which have been forwarded to the Governments of India and Madras.

Sir Charles Wood wishes me to express to you his sense of the great value of the chemical investigations which you have undertaken at his request, on this and other occasions; and to thank you for the careful attention you have bestowed on the analysis of the Chinchona bark, which has been, from time to time, placed in your hands.

The last analysis appears to have been particularly satisfactory, and to have shown distinctly that cultivation in India has improved the produce of the Chinchona plants.

I am, &c.
(signed) *Herman Merivale.*

— No. 27. —

From the Government of Madras to the Secretary of State for India.

Madras, 23 July 1864.

WE have the honour to forward for your information the accompanying Tabular Report on the number, condition, &c., of the Chinchona plants on the Neilgherries, on the 30th June 1864.

Enclosure in No. 27.

REPORT on the Number, Distribution, and Condition of Chinchona Plants on the Neilgherries, on the 30th June 1864.

No. of Species.	Botanical Names.	Commercial Names.	Number of Plants.	Value per Lb. of Dry Bark in the London Market.		REMARKS.
				s. d.	s. d.	
1	<i>C. succirubra</i> - -	Red Bark - -	107,262	2 8	to 8 9	<p>The number of plants planted out on the plantations during the month is 15,350, making the total 159,666 plants permanently planted out.</p> <p>The increase by propagation is 31,984, being 9,328 plants above the average of the last six months, making the total number of plants at the end of the month 400,214.</p>
2	<i>C. Calisaya</i> - -	Yellow Bark - -	2,294	2 10	to 7 -	
3	<i>C. officinalis</i> , var. <i>Condaminea</i> (<i>C. Uritusinga</i>).	Original Loxa Bark -	4,222	2 10	to 7 -	
4	<i>C. officinalis</i> , var. <i>Bouplandiana</i> (<i>C. Chahuarguera</i>).	Select Crown Bark -	257,204	2 10	to 7 -	
5	<i>C. crespilla</i> - -	Fine Grey Bark - -	1,982	2 10	to 6 -	
6	<i>C. lancifolia</i> - -	Pitayo Bark - -	18	1 8	to 2 10	
7	<i>C. nitida</i> - -	Genuine Grey Bark -	8,477	1 8	to 2 9	
8	<i>C. Species</i> without name.	Fine Bark - -	2,780	1 8	to 2 10	
9	<i>C. micrantha</i> - -	Grey Bark - -	12,307	1 8	to 2 9	
10	<i>C. Peruviana</i> - -	Finest Grey Bark -	3,213	1 8	to 2 10	
11	<i>C. Pahudiana</i> - -	Unknown - -	425	Worthless.		
TOTAL Number of Plants - - -			400,214			

TABLE II.

MEMORANDUM of the Growth of Eleven Plants of *C. succirubra*, planted on the Second Denison Plantation, at Nedddivuttum, on 30 August 1862.

Number of Plants.	Height in Inches when Planted on the 30th August 1862.	Height in Inches on the 31st May 1864.	Height in Inches on the 30th June 1864.	Growth in Inches during June 1864.	By whom Planted.
1	23	98	99	1	His Excellency Sir W. Denison.
2	16½	90	91	1	
3	19	87	90	3	
4	15	91½	98	1½	J. W. Breeks, Esq.
5	27	106	107	1	
6	20	78	80½	2½	Dr. Sanderson.
7	20	96	97½	1½	
8	18	93	96½	3½	J. D. Sim, Esq.
9	20	94	97	3	
10	20	101	103½	2½	Lieutenant McLeod.
11	18	89	92½	3½	
12	-	35	37	2	Plant cut down for bark.

TABLE II. exhibits the growth of eleven plants of *Chinchona succirubra* planted out by his Excellency the Governor, and other gentlemen, at Nedddivuttum, on the 30th August 1862. The average growth of these plants during the month is 2¼ inches, or ¼ of an inch above the average growth of last month.

One of the two plants cut down on the 20th of March 1863 for the bark submitted to Mr. Howard for analysis, has made strong shoots of 37 inches in height, giving the growth of 2 inches during the month, or 1½ inches under the growth of last month.

TABLE III.

SHOWING the Height of Twelve Plants of *C. officinalis*, planted on the Dodabetta Plantation at Ootacamund, on the 30th September 1863.

Number of Plants.	Height in Inches when Planted on the 30th September 1863.	Height in Inches on the 31st May 1864.	Height in Inches on the 30th June 1864.	Growth in Inches during June 1864.	REMARKS.
1	19	44	49	5	The twelve plants of <i>Chinchona officinalis</i> (a shrubby species) on the Dodabetta Plantation give an average growth of $4\frac{1}{4}$ inches, or $\frac{2}{3}$ of an inch above the growth of last month.
2	14 $\frac{1}{2}$	37 $\frac{1}{2}$	41 $\frac{1}{2}$	4	
3	28	54	55	1 $\frac{1}{2}$	
4	22	49	54 $\frac{1}{2}$	5 $\frac{1}{2}$	
5	21 $\frac{1}{2}$	44	49	5	
6	28	54	58	4	
7	22 $\frac{1}{2}$	46 $\frac{1}{2}$	50	3 $\frac{1}{2}$	
8	21 $\frac{1}{2}$	48 $\frac{1}{2}$	51 $\frac{1}{2}$	3	
9	21 $\frac{1}{2}$	52 $\frac{1}{2}$	58	5 $\frac{1}{2}$	
10	19 $\frac{1}{2}$	50	53	3	
11	24	50	53 $\frac{1}{2}$	3 $\frac{1}{2}$	
12	24	47 $\frac{1}{2}$	52 $\frac{1}{2}$	5	

TABLE IV.

REGISTER of *Chinchona* Plants Distributed.

NAMES.	STATION.	Number of Plants.
Mr. F. N. Maltby - - - -	Travancore - - - -	16
Dr. Junghun - - - -	Java - - - -	56
Mr. A. R. Lascelles - - - -	Ootacamund - - - -	12
Mr. M. Anderson - - - -	Jamaica - - - -	2
Dr. Wiehe - - - -	Bombay - - - -	10
Dr. T. Anderson - - - -	Calcutta - - - -	554
Dr. Jamieson - - - -	Saharanpore - - - -	107
Professor Lees - - - -	Calcutta - - - -	547
Rajah of Travancore - - - -	Travancore - - - -	521
Major Morgan - - - -	Ootacamund - - - -	1,534
Mr. E. T. Fitzgerald - - - -	Calcutta - - - -	405
Mr. J. W. Money - - - -	- ditto - - - -	581
Dr. W. Bourne - - - -	- ditto - - - -	532
Captain Cox - - - -	Wainad - - - -	6
Mr. Hallock - - - -	- ditto - - - -	2
Mr. T. Sheffield - - - -	Ootacamund - - - -	12
Dr. F. Day - - - -	Cochin - - - -	100
Mr. Brown - - - -	Tellicherry - - - -	12
„ J. Hall - - - -	Ootacamund - - - -	144
„ J. Knop - - - -	- ditto - - - -	18
Captain Lees - - - -	Bengal - - - -	281
Mr. W. H. Rayne - - - -	Manantoddy - - - -	24
Rev. — Sawyer - - - -	Ootacamund - - - -	1,018
Mr. Friend - - - -	- ditto - - - -	12
„ Hallock - - - -	- ditto - - - -	1
„ J. Perie - - - -	Seegoor - - - -	12
Colonel Scott - - - -	Ootacamund - - - -	1,024
Mr. F. Berend - - - -	Cachar - - - -	275
Rev. J. Hunter - - - -	Coonoor - - - -	12
Mr. J. Mullaly - - - -	- ditto - - - -	24

The number of plants issued to the public is 2,015, making the total number of plants distributed 33,677.

TABLE IV.—Register of Chinchona Plants Distributed—*continued.*

NAMES.	STATION.	Number of Plants.	REMARKS.
Mr. W. H. Stanes - - - -	Coonoor - - - -	12	
Colonel R. Cooper - - - -	Kotagherry - - - -	12	
Mr. F. Cockburn - - - -	- ditto - - - -	12	
Colonel Woodfall - - - -	Coonoor - - - -	12	
Mr. C. Anderson - - - -	- ditto - - - -	24	
Colonel Angelo - - - -	Ootacamund - - - -	12	
Rev. E. Laseron - - - -	- ditto - - - -	12	
Captain R. N. Taylor - - - -	Coorg - - - -	96	
Major W. Agnew - - - -	Assam - - - -	189	
Mr. V. H. Levinge - - - -	Madura - - - -	12	
Chief Commissioner - - - -	Nagpore - - - -	28	
Mr. Fletcher - - - -	Ootacamund - - - -	24	
Gool Mahomed - - - -	- ditto - - - -	20	
General McCleverty - - - -	New Zealand - - - -	23	
Mr. W. Robinson - - - -	Kotagherry - - - -	18	
" Crake - - - -	Wainad - - - -	12	
" H. R. Dawson - - - -	Seegoor - - - -	12	
Captain Mann - - - -	Coorg - - - -	48	
Mr. E. Roberts - - - -	Ootacamund - - - -	6	
" H. Russell - - - -	Wainad - - - -	12	
Rev. -- Wait - - - -	Coonoor - - - -	2	
Mr. H. de Facien - - - -	Katary - - - -	5,189	
Collector of Belgaum - - - -	Belgaum - - - -	28	
" " " Honore - - - -	Honore - - - -	28	
Dr. Ross - - - -	- ditto - - - -	15	
His Excellency the Governor of Bombay - - - -	Bombay - - - -	158	
Mr. H. Hinde - - - -	Wainad - - - -	12	
" E. B. Thomas - - - -	Coonoor - - - -	12	
Rajah of Poonganoor - - - -	Poonganoor - - - -	12	
Major Grant - - - -	Wellington - - - -	118	
Messrs. Thomson, Shaw & Co. - - - -	Poonganoor - - - -	28	
Mr. J. H. Trinson - - - -	- ditto - - - -	31	
Dr. Muller - - - -	Melbourne - - - -	28	
Mr. Tyrrell - - - -	Mysore - - - -	12	
Dr. Sayers - - - -	Vellore - - - -	12	
Major C. P. Taylor - - - -	Ootacamund - - - -	3,181	
Doctor Wilson - - - -	- ditto - - - -	6	
Mr. Schuarie - - - -	- ditto - - - -	15,000	
Captain Fuller - - - -	Coonoor - - - -	147	
Mr. Drummond - - - -	Ootacamund - - - -	224	
Captain Jennings - - - -	- ditto - - - -	200	
Lieut. H. B. Montmorency - - - -	Bangalore - - - -	6	
Mr. McHutchin - - - -	Ootacamund - - - -	3	
Colonel Molesworth - - - -	- ditto - - - -	6	
Mr. C. Gray - - - -	Coonoor - - - -	12	
" H. B. Liddell - - - -	Ootacamund - - - -	12	
" Minchin - - - -	Wynad - - - -	800	
TOTAL Number of Plants - - - -		33,677	

Ootacamund,
13 July 1864.

(signed) *W. G. McIvor,*
Superintendent Government Chinchona Plantations.

— No. 28. —

From the Government of Madras to the Secretary of State for India.

Madras, 25 August 1864.

We have the honour to forward for your information the accompanying Tabular Report on the number, condition, &c., of the Chinchona plants on the Neilgherries on the 31st July 1864.

Enclosure in No. 28.

REPORT on the Number, Distribution, and Condition of Chinchona Plants on the Neilgherries, on the 31st July 1864.

No. of Species.	Botanical Names.	Commercial Names.	Number of Plants.	Value per Lb. of Dry Bark in the London Market.		REMARKS.
				s. d.	s. d.	
1	<i>C. succirubra</i> - -	Red Bark - -	115,400	2 6	to 8 9	The month being very wet and stormy, caused several land slips on the Neddivuttum Plantations, destroying 2,100 transplanted plants. The number of plants planted out during the month is 3,985, from which, deducting the loss of 2,100, makes the total number 161,551 plants permanently planted out. The increase by propagation is 17,486, being 7,393 plants under the average of the last six months, making the total number of plants at the end of the month 412,343.
2	<i>C. Calisaya</i> - -	Yellow Bark - -	2,369	2 10	to 7 -	
3	<i>C. officinalis</i> , var. <i>Condaminea</i> (<i>C. Uritusinga</i>).	Original Loxa Bark -	1,661	2 10	to 7 -	
4	<i>C. officinalis</i> , var. <i>Bonplandiana</i> (<i>C. Chahuarguera</i>).	Select Crown Bark -	262,964	2 10	to 7 -	
5	<i>C. crespilla</i> - -	Fine Grey Bark - -	2,108	2 10	to 6 -	
6	<i>C. lancifolia</i> - -	Pitayo Bark - -	18	1 8	to 2 10	
7	<i>C. nitida</i> - -	Genuine Grey Bark -	8,481	1 8	to 2 9	
8	<i>C. Species</i> without name.	Fine Bark - -	2,780	1 8	to 2 10	
9	<i>C. micrantha</i> - -	Grey Bark - -	12,839	1 8	to 2 9	
10	<i>C. Peruviana</i> - -	Finest Grey Bark -	3,303	1 8	to 2 10	
11	<i>C. Pahudiana</i> - -	Unknown - -	425	Worthless.		
TOTAL Number of Plants - - -			412,343			

TABLE II.

MEMORANDUM of the Growth of Eleven Plants of *C. succirubra*, planted on the Second Denison Plantation, at Neddivuttum, on 30 August 1862.

Number of Plants.	Height in Inches when Planted on 30 August 1862.	Height in Inches on 30 June 1864.	Height in Inches on 31 July 1864.	Growth in Inches during July 1864.	By whom Planted.
1	23	99	100½	1½	His Excellency Sir W. Denison. J. W. Brecks, Esq. Dr. Sanderson. J. D. Sim, Esq. Lieutenant McLeod. P. Grant, Esq. Plant cut down for bark.
2	16½	91	98	2	
3	19	90	92	2	
4	15	93	93½	½	
5	27	107	108	1	
6	20	80½	82	1½	
7	20	97½	100	2½	
8	18	96½	98	1½	
9	20	97	98½	1½	
10	20	103½	103½	½	
11	18	92½	93½	1	
12	-	37	39½	2½	

TABLE II. exhibits the growth of 11 plants of *Chinchona succirubra* planted out by his Excellency the Governor and other gentlemen at Neddivuttum on the 30th August 1862. The average growth of these plants during the month is 1¼ inches or ¼ of an inch under the growth of last month.

One of the two plants cut down on the 20th of March 1863 for the bark, submitted to Mr. Howard for analysis, has made strong shoots of 39½ inches in height, giving the growth of 2½ inches during the month, or ½ an inch above the growth of last month.

TABLE III.
SHOWING the Height of Twelve Plants of *C. officinalis*, planted on the Dodabetta Plantation at Ootacamund, on the 30th September 1863.

Number of Plants.	Height in Inches when Planted on the 30th September 1863.	Height in Inches on the 30th June 1864.	Height in Inches on the 31st July 1864.	Growth in Inches during July 1864.	REMARKS.
1	19	49	52	3½	The 12 plants of <i>Chinchona officinalis</i> (a shrubby species) on the Dodabetta Plantation, give an average growth of 3 inches, or 1¼ inches under the growth of last month.
2	14½	41½	54	2½	
3	28	55	58	3	
4	22	54½	56	1½	
5	21½	49	52	3	
6	28	58	59	1	
7	22½	50	59	4	
8	21½	51½	56	4½	
9	21½	58	62	4	
10	19½	53	56	3	
11	24	53½	55	1½	
12	24	52	57	4½	

TABLE IV.
REGISTER of Chinchona Plants Distributed.

NAMES.	STATIONS.	Number of Plants.
Mr. F. N. Maltby - - - -	Travancore - - - -	16
Dr. Junghun - - - -	Java - - - -	56
Mr. A. R. Lascelles - - - -	Ootacamund - - - -	12
Mr. M. Anderson - - - -	Jamaica - - - -	2
Dr. Wiehe - - - -	Bombay - - - -	10
Dr. T. Anderson - - - -	Calcutta - - - -	554
Dr. Jamieson - - - -	Saharanpore - - - -	107
Professor Lees - - - -	Calcutta - - - -	547
Rajah of - - - -	Travancore - - - -	521
Major Morgan - - - -	Ootacamund - - - -	1,534
Mr. E. T. Fitzgerald - - - -	Calcutta - - - -	405
Mr. J. W. Money - - - -	- ditto - - - -	581
Dr. W. Bourne - - - -	- ditto - - - -	532
Captain Cox - - - -	Wainud - - - -	6
Mr. Hallock - - - -	- ditto - - - -	2
Mr. T. Sheffield - - - -	Ootacamund - - - -	12
Dr. F. Day - - - -	Cochin - - - -	100
Mr. Brown - - - -	Tellicherry - - - -	12
Mr. J. Hall - - - -	Ootacamund - - - -	144
Mr. J. Knop - - - -	- ditto - - - -	18
Captain Lees - - - -	Bengal - - - -	281
Mr. W. H. Rayne - - - -	Manantoddy - - - -	24
Rev. — Sawyer - - - -	Ootacamund - - - -	1,016
Mr. Friend - - - -	- ditto - - - -	12
Mr. Hallock - - - -	- ditto - - - -	1
Mr. J. Perie - - - -	Seegoor - - - -	12
Colonel Scott - - - -	Ootacamund - - - -	1,024
Mr. F. Berend - - - -	Cachar - - - -	275
Rev. J. Hunter - - - -	Coonoor - - - -	12
Mr. J. Mullaly - - - -	- ditto - - - -	24
Mr. W. H. Stanes - - - -	- ditto - - - -	12
Colonel R. Cooper - - - -	Kotagherry - - - -	12
Mr. F. Cookbarn - - - -	- ditto - - - -	12
Colonel Woodfall - - - -	Coonoor - - - -	12
Mr. C. Anderson - - - -	- ditto - - - -	24
Colonel Angelo - - - -	Ootacamund - - - -	12
Rev. E. Laseron - - - -	- ditto - - - -	12
Captain R. N. Taylor - - - -	Coorg - - - -	96
Major W. Agnew - - - -	Assam - - - -	139
Mr. V. H. Levinge - - - -	Madura - - - -	19
Chief Commissioner - - - -	Nagpore - - - -	28
Mr. Fletcher - - - -	Ootacamund - - - -	24
Gool Mahomed - - - -	- ditto - - - -	20

The number of plants issued to the public is 5,357, making the total number of plants distributed 39,034.

TABLE IV.—Register of Chinchona Plants Distributed, &c.—*continued.*

NAMES.	STATIONS.	Number of Plants.	REMARKS.
General McCleverty - - -	New Zealand - - -	23	
Mr. W. Robinson - - -	Kotagherry - - -	18	
Mr. Crake - - -	Wynad - - -	12	
Mr. H. R. Dawson - - -	Seegoor - - -	12	
Captain Mann - - -	Coorg - - -	48	
Mr. E. Roberts - - -	Ootacamund - - -	6	
Mr. H. Russell - - -	Wynad - - -	12	
Reverend — Wait - - -	Coonoor - - -	2	
Mr. H. de Facien - - -	Katary - - -	5,189	
Collector of Belgaum - - -	Belgaum - - -	28	
Collector of Honore - - -	Honore - - -	28	
Dr. Ross - - -	- ditto - - -	15	
His Excellency the Governor - - -	Bombay - - -	158	
Mr. H. Hinde - - -	Wynad - - -	12	
Mr. E. B. Thomas - - -	Coonoor - - -	12	
Rajah of Poonganoor - - -	Poonganoor - - -	12	
Major Grant - - -	Wellington - - -	226	
Messrs. Thomson, Shaw & Co. - - -	Poonganoor - - -	28	
Mr. J. H. Trinson - - -	- ditto - - -	31	
Dr. Muller - - -	Melbourne - - -	28	
Mr. Tyrrell - - -	Mysore - - -	12	
Dr. Sayers - - -	Vellore - - -	12	
Major C. P. Taylor - - -	Ootacamund - - -	5,250	
Doctor Wilson - - -	- ditto - - -	6	
Mr. Schnarie - - -	- ditto - - -	15,000	
Captain Fuller - - -	Coonoor - - -	266	
Mr. Drummond - - -	Ootacamund - - -	224	
Captain Jennings - - -	- ditto - - -	730	
Lieutenant H. B. Montmorency - - -	Bangalore - - -	6	
Mr. McHutchin - - -	Ootacamund - - -	3	
Colonel Molesworth - - -	- ditto - - -	6	
Mr. C. Gray - - -	Coonoor - - -	12	
Mr. H. B. Liddell - - -	Ootacamund - - -	12	
Mr. Minchin - - -	Wynad - - -	1,600	
His Excellency the Governor - - -	Vizagapatam - - -	35	
Mr. R. F. Phillips - - -	Kotagherry - - -	667	
Colonel Cooke - - -	- ditto - - -	24	
Mr. G. J. Glasson - - -	Wynad - - -	1,000	
TOTAL Number of Plants - - -		39,034	

Ootacamund,
15 August 1864.

(signed) *W. G. McIvor,*
Superintendent Government Chinchona Plantations

— No. 29. —

From the Government of Madras to the Secretary of State for India.

Madras, 13 September 1864.

We have the honour to forward for your information the accompanying Tabular Report on the number, condition, &c., of the Chinchona plants on the Neilgherries on the 31st August 1864.

Enclosure in No. 29.

REPORT on the Number, Distribution, and Condition of Chinchona Plants on the Neilgherries, on the 31st August 1864.

No. of Specimens.	Botanical Names.	Commercial Names.	Number of Plants.	Value per Lb. of Dry Bark in the London Market.		REMARKS.
				s. d.	s. d.	
1	<i>C. succirubra</i> - -	Red Bark - -	114,053	2 6	to 8 9	<p>The number of plants planted out on the plantations during the month is 12,000, making the total 173,551 plants permanently planted out.</p> <p>The increase by propagation is 18,420, being 6,687 plants under the average of the last six months, making the total number of plants at the end of the month 424,899.</p>
2	<i>C. Calisaya</i> - -	Yellow Bark - -	2,392	2 10	to 7 -	
3	<i>C. officinalis</i> , var. <i>Condaminea</i> (<i>C. Uritusinga</i>).	Original Loxa Bark -	587	2 10	to 7 -	
4	<i>C. officinalis</i> , var. <i>Bonplandiana</i> (<i>C. Chahuarguera</i>).	Select Crown Bark -	277,682	2 10	to 7 -	
5	<i>C. crespilla</i> - -	Fine Grey Bark - -	2,062	2 10	to 6 -	
6	<i>C. lancifolia</i> - -	Pitayo Bark - -	20	1 8	to 2 10	
7	<i>C. nitida</i> - -	Genuine Grey Bark -	8,483	1 8	to 2 9	
8	<i>C. species</i> without name.	Fine Bark - -	2,780	1 8	to 2 10	
9	<i>C. micrantha</i> - -	Grey Bark - -	18,084	1 8	to 2 9	
10	<i>C. Peruviana</i> - -	Finest Grey Bark -	3,331	1 8	to 2 10	
11	<i>C. Pahudiana</i> - -	Unknown - -	425	Worthless.		
TOTAL Number of Plants - - -			424,899			

TABLE II.

MEMORANDUM of the Growth of Eleven Plants of *C. succirubra*, planted on the Second Denison Plantation, at Neddivuttum, on 30 August 1862.

Number of Plants.	Height in Inches when Planted on 30 August 1862.	Height in Inches on 31 July 1864.	Height in Inches on 31 August 1864.	Growth in Inches during August 1864.	By whom Planted.
1	23	100½	108	2½	<p>His Excellency Sir W. Denison.</p> <p>J. W. Brecks, Esq. Dr. Sanderson. J. D. Sim, Esq. Lieutenant McLeod. P. Grant, Esq. Plant cut down for bark.</p>
2	16½	93	94½	1½	
3	19	92	94	2	
4	15	93½	95	1½	
5	27	108	112	4	
6	20	82	83½	1½	
7	20	100	101	1	
8	18	98	98½	0½	
9	20	98½	99	0½	
10	20	103½	105	1½	
11	18	93½	95	1½	
12	-	39½	45	5½	

TABLE II. exhibits the growth of 11 plants of *Chinchona succirubra*, planted out by His Excellency the Governor, and other gentlemen at Neddivuttum, on the 30th August 1862. The average growth of these plants during the month is 1½ inches, or ⅓ of an inch above the growth of last month.

One of the two plants cut down on the 20th of March 1863 for the bark submitted to Mr. Howard for analysis, has made strong shoots of 45 inches in height, giving the growth of 5½ inches during the month, or 3 inches above the growth of last month.

TABLE III.

SHOWING the Height of Twelve Plants of *C. officinalis* planted on the Dodabetta Plantation at Ootacamund, on the 30th September 1863.

Number of Plants.	Height in Inches when Planted on 30 September 1863.	Height in Inches on 31 July 1864.	Height in Inches on 31 August 1864.	Height in Inches during August 1864.	REMARKS.
1	19	52½	56	3½	The 12 plants of <i>Chinchona officinalis</i> (a shrubby species) on the Dodabetta Plantation, gives an average growth of 3½ inches, or ¼ of an inch above the growth of last month.
2	14½	44	47½	3½	
3	28	58	60½	2½	
4	22	56	60	4	
5	21½	52	56½	4½	
6	28	59	63	4	
7	22½	54	56	2	
8	21½	56	58	2	
9	21½	62	66½	4½	
10	19½	56	59	3	
11	24	55	59	4	
12	24	57	61	4	

TABLE IV.

REGISTER of Plants Distributed.

NAMES.	STATION.	Number of Plants.
Mr. F. N. Maltby - - - -	Travancore - - - -	16
Dr. Junghuhn - - - -	Java - - - -	56
Mr. A. R. Lascelles - - - -	Ootacamund - - - -	12
„ M. Anderson - - - -	Jamaica - - - -	2
Dr. Wiehe - - - -	Bombay - - - -	10
„ T. Anderson - - - -	Calcutta - - - -	554
„ Jamieson - - - -	Saharanpore - - - -	107
Professor Lees - - - -	Calcutta - - - -	547
Rajah of Travancore - - - -	Travancore - - - -	521
Major Morgan - - - -	Ootacamund - - - -	1,534
Mr. E. T. Fitzgerald - - - -	Calcutta - - - -	405
„ J. W. B. Money - - - -	- ditto - - - -	1,869
Dr. W. Bourne - - - -	- ditto - - - -	532
Captain Cox - - - -	Wynad - - - -	6
Mr. Hallock - - - -	- ditto - - - -	2
„ T. Sheffield - - - -	Ootacamund - - - -	12
Dr. F. Day - - - -	Cochin - - - -	100
Mr. Brown - - - -	Tellicherry - - - -	12
„ J. Hall - - - -	Ootacamund - - - -	144
„ J. Knop - - - -	- ditto - - - -	18
Captain Lees - - - -	Bengal - - - -	281
Mr. W. H. Rayne - - - -	Manantoddy - - - -	24
Rev. Sawyer - - - -	Ootacamund - - - -	1,018
Mr. A. Friend - - - -	- ditto - - - -	112
„ Hallock - - - -	- ditto - - - -	1
Mr. J. Perie - - - -	Seegoor - - - -	12
Colonel Scott - - - -	Ootacamund - - - -	1,024
Mr. F. Berend - - - -	Cachar - - - -	275
Rev. J. Hunter - - - -	Coonoor - - - -	12
Mr. J. Mullaly - - - -	- ditto - - - -	24
„ W. H. Stanes - - - -	- ditto - - - -	12
Colonel R. Cooper - - - -	Kotagherry - - - -	12
Mr. F. Cockburn - - - -	- ditto - - - -	12
Colonel Woodfall - - - -	Coonoor - - - -	12
Mr. C. Anderson - - - -	- ditto - - - -	24
Colonel Angelo - - - -	Ootacamund - - - -	12
Rev. E. Laseron - - - -	- ditto - - - -	12
Captain R. N. Taylor - - - -	Coorg - - - -	96

The number of plants issued to the public is 5,864, making the total number of plants distributed 44,898.

TABLE IV.—Register of Plants distributed—*continued.*

NAMES.	STATION.	Number of Plants.	REMARKS.
Major W. Agnew - - - -	Assam - - - -	139	
Mr. V. H. Levinge - - - -	Madura - - - -	12	
Chief Commissioner - - - -	Nagpore - - - -	28	
Mr. Fletcher - - - -	Ootacamund - - - -	24	
Gool Mahomed - - - -	- ditto - - - -	20	
General McCleverty - - - -	New Zealand - - - -	23	
Mr. W. Robinson - - - -	Kotagherry - - - -	18	
„ Crake - - - -	Wynad - - - -	12	
„ H. B. Dawson - - - -	Seegoor - - - -	12	
Captain Mann - - - -	Coorg - - - -	46	
Mr. E. Roberts - - - -	Ootacamund - - - -	6	
„ H. Russell - - - -	Wynad - - - -	12	
Rev. — Wait - - - -	Coonoor - - - -	2	
Mr. H. de Facien - - - -	Katary - - - -	5,189	
Collector of Belgaum - - - -	Belgaum - - - -	28	
„ Honore - - - -	Honore - - - -	28	
Dr. Ross - - - -	- ditto - - - -	15	
His Excellency the Governor - - - -	Bombay - - - -	158	
Mr. H. Hinde - - - -	Wynad - - - -	12	
„ E. B. Thomas - - - -	Coonoor - - - -	12	
Rajah of Poonganoor - - - -	Poonganoor - - - -	12	
Major Grant - - - -	Wellington - - - -	226	
Messrs. Thomson, Shaw & Co. - - - -	Poonganoor - - - -	28	
Mr. J. H. Trinson - - - -	- ditto - - - -	81	
Dr. Muller - - - -	Melbourne - - - -	28	
Mr. Tyrrell - - - -	Mysore - - - -	12	
Dr. Sayers - - - -	Vellore - - - -	12	
Major C. P. Taylor - - - -	Ootacamund - - - -	5,250	
Doctor Wilson - - - -	- ditto - - - -	6	
Mr. Schnarie - - - -	- ditto - - - -	15,000	
Captain Fuller - - - -	Coonoor - - - -	266	
Mr. Drummond - - - -	Ootacamund - - - -	224	
Captain Jennings - - - -	- ditto - - - -	1,756	
Lieut. H. B. Montmorency - - - -	Bangalore - - - -	6	
Mr. McHutchin - - - -	Ootacamund - - - -	3	
Colonel Molesworth - - - -	- ditto - - - -	6	
Mr. C. Gray - - - -	Coonoor - - - -	12	
„ H. B. Liddell - - - -	Ootacamund - - - -	12	
„ Minchin - - - -	Wynad - - - -	1,600	
His Excellency the Governor - - - -	Vizagapatam - - - -	36	
Mr. R. F. Phillips - - - -	Kotagherry - - - -	1,117	
Colonel Cooke - - - -	- ditto - - - -	24	
Mr. G. J. Glasson - - - -	Wynad - - - -	1,000	
Dr. Macpherson - - - -	Mercara - - - -	400	
Mr. W. H. Kerr - - - -	Coorg - - - -	3,100	
TOTAL Number of Plants - - - -		44,898	

(signed) *W. G. McIvor,*
 Superintendent Government Chinchona Plantations.

Ootacamund,
 9 September 1864.

— No. 30. —

From the Government of Madras to the Secretary of State for India.

Madras, 19 October 1864.

We have the honour to forward, for your information, the accompanying Tabular Report on the number, condition, &c., of the Chinchona plants on the Neilgherries, on the 30th September 1864.

Enclosure in No. 30.

REPORT on the Number, Distribution, and Condition of Chinchona Plants on the Neilgherries, on the 30th September 1864.

No. of Species.	Botanical Names.	Commercial Names.	Number of Plants.	Value per Lb. of Dry Bark in the London Market.		REMARKS.
				s. d.	s. d.	
1	<i>C. succirubra</i> - -	Red Bark - -	119,185	2 6	to 8 9	The planting season having passed, the number of plants planted out in the plantations remain the same as in the last month, viz., 173,551. The increase by propagation is 21,600, being 1,176 plants under the average of the last six months, making the total number of plants at the end of the month 445,291.
2	<i>C. Calisaya</i> - -	Yellow Bark - -	2,481	2 10	to 7 -	
3	<i>C. officinalis</i> , var. <i>Condaminea</i> (<i>C. Uritusinga</i>).	Original Loxa Bark	1,529	2 10	to 7 -	
4	<i>C. officinalis</i> , var. <i>Bonplandiana</i> (<i>C. Chahuarguera</i>).	Select Crown Bark -	291,085	2 10	to 7 -	
5	<i>C. crespilla</i> - -	Fine Grey Bark - -	2,230	2 10	to 6 -	
6	<i>C. lancifolia</i> - -	Pitayo Bark - -	20	1 8	to 2 10	
7	<i>C. nitida</i> - -	Genuine Grey Bark	8,483	1 8	to 2 9	
8	<i>C. species</i> without name.	Fine Bark - -	2,780	1 8	to 2 10	
9	<i>C. micrantha</i> - -	Grey Bark - -	13,787	1 8	to 2 9	
10	<i>C. Peruviana</i> - -	Finest Grey Bark -	3,336	1 8	to 2 10	
11	<i>C. Pahudiana</i> - -	Unknown - -	425	Worthless.		
TOTAL Number of Plants - - -			445,291			

TABLE II.

MEMORANDUM of the Growth of Eleven Plants of *C. succirubra*, planted on the Second Denison Plantation, at Neddivuttum, on 30 August 1862.

Number of Plants.	Height in Inches when Planted on 30 August 1862.	Height in Inches on 31 August 1864.	Height in Inches on 30 September 1864.	Growth in Inches during September 1864.	By whom Planted.
1	23	103	105	2	His Excellency Sir W. Denison.
2	16½	94½	96	1½	
3	19	94	96	2	
4	15	95	96½	1½	
5	27	112	113½	1½	
6	20	83½	85	1½	
7	20	101	104½	3½	J. W. Brecks, Esq.
8	18	98½	100½	2	Dr. Sanderson.
9	20	99	103	4	J. D. Sim, Esq.
10	20	105	106½	1½	Lieutenant McLeod.
11	18	95	95½	½	P. Grant, Esq.
12	-	46	48	3	Plant cut down for bark.

TABLE II. exhibits the growth of 11 plants of *Chinchona succirubra* planted out by his Excellency the Governor, and other gentlemen, at Neddivuttum, on the 30th August 1862. The average growth of these plants during the month is 2 inches, being $\frac{1}{4}$ of an inch above the growth of last month.

One of the two plants cut down on the 20th of March 1863, for the bark submitted to Mr. Howard for analysis, has made strong shoots of 48 inches in height, giving the growth of 3 inches during the month.

TABLE III.

SHOWING the Height of Twelve Plants of *C. officinalis*, planted on the Dodabetta Plantation at Ootacamund, on the 30th September 1863.

Number of Plants.	Height in Inches when Planted on 30 September 1863.	Height in Inches on 31 August 1864.	Height in Inches on 30 September 1864.	Growth in Inches during September 1864.	REMARKS.
1	19	56	59	3	The twelve plants of <i>Chinchona officinalis</i> (a shrubby species) on the Dodabetta Plantation gives an average growth of three inches, or $\frac{1}{4}$ of an inch, under the growth of last month.
2	14 $\frac{1}{2}$	47 $\frac{1}{2}$	50	2 $\frac{1}{2}$	
3	28	60 $\frac{1}{2}$	64	3 $\frac{1}{2}$	
4	22	60	63 $\frac{1}{2}$	3 $\frac{1}{2}$	
5	21 $\frac{1}{2}$	58 $\frac{1}{2}$	60	3 $\frac{1}{2}$	
6	28	63	66 $\frac{1}{2}$	3 $\frac{1}{2}$	
7	22 $\frac{1}{2}$	58	59	3	
8	21 $\frac{1}{2}$	58	60 $\frac{1}{2}$	2 $\frac{1}{2}$	
9	21 $\frac{1}{2}$	66 $\frac{1}{2}$	68 $\frac{1}{2}$	2	
10	19 $\frac{1}{2}$	59	62	3	
11	24	59	62 $\frac{1}{2}$	3 $\frac{1}{2}$	
12	24	61	63 $\frac{1}{2}$	2 $\frac{1}{2}$	

TABLE IV.
REGISTER of Plants Distributed.

NAMES.	STATION.	Number of Plants.
Mr. F. N. Malthby -	Travancore -	16
Dr. Junghuhn -	Java -	56
Mr. A. R. Lascelles -	Ootacamund -	12
Mr. M. Anderson -	Jamaica -	2
Dr. Wiehe -	Bombay -	10
Dr. T. Anderson -	Calcutta -	554
Dr. Jamieson -	Saharanpore -	107
Professor Lees -	Calcutta -	547
Rajah of Travancore -	Travancore -	521
Major Morgan -	Ootacamund -	1,534
Mr. E. T. Fitzgerald -	Calcutta -	405
Mr. J. W. B. Money -	- ditto -	1,369
Dr. W. Bourne -	- ditto -	532
Captain Cox -	Wynad -	6
Mr. Hallock -	- ditto -	2
Mr. T. Sheffield -	Ootacamund -	12
Dr. F. Day -	Cochin -	100
Mr. Brown -	Tellicherry -	12
Mr. J. Hall -	Ootacamund -	144
Mr. J. Kuop -	- ditto -	18
Captain Lees -	Bengal -	281
Mr. W. H. Rayne -	Manantoddy -	24
Reverend — Sawyer -	Ootacamund -	1,018
Mr. Frend -	- ditto -	112
Mr. Hallock -	- ditto -	1
Mr. J. Perie -	Seegoor -	12
Colonel Scott -	Ootacamund -	1,126
Mr. Berend -	Cachar -	275
Rev. J. Hunter -	Coonoor -	12
Mr. J. Mullaly -	- ditto -	24
Mr. W. H. Stanes -	- ditto -	12
Colonel R. Cooper -	Kotgherry -	12
Mr. F. Cockburn -	- ditto -	12
Colonel Woodfull -	Coonoor -	12

The number of plants issued to the public is 1,208, making the total number of plants distributed 46,106.

TABLE IV.—REGISTER of Plants Distributed—*continued.*

NAMES.	STATION.	Number of Plants.	REMARKS.
Mr. C. Anderson - - - -	Coonoor - - - -	24	
Colonel Angelo - - - -	Ootacamund - - - -	12	
Rev. E. Laseron - - - -	- ditto - - - -	12	
Captain R. N. Taylor - - - -	Coorg - - - -	96	
Major W. Agnew - - - -	Assam - - - -	139	
Mr. V. H. Levinge - - - -	Madura - - - -	12	
Chief Commissioner - - - -	Nagpore - - - -	28	
Mr. Fletcher - - - -	Ootacamund - - - -	24	
Gool Mahomed - - - -	- ditto - - - -	20	
General McCleverty - - - -	New Zealand - - - -	23	
Mr. W. Robinson - - - -	Kotagherry - - - -	18	
Mr. Crake - - - -	Wynad - - - -	12	
Mr. H. R. Dawson - - - -	Seegoor - - - -	12	
Captain Mann - - - -	Coorg - - - -	48	
Mr. E. Roberts - - - -	Ootacamund - - - -	80	
Mr. H. Russell - - - -	Wynad - - - -	12	
Rev. -- Wait - - - -	Coonoor - - - -	2	
Mr. H. de Facien - - - -	Katary - - - -	5,189	
Collector of Belgaum - - - -	Belgaum - - - -	28	
Collector of Honore - - - -	Honore - - - -	28	
Dr. Ross - - - -	- ditto - - - -	15	
His Excellency the Governor - - - -	Bombay - - - -	158	
Mr. H. Hinde - - - -	Wynad - - - -	12	
Mr. E. B. Thomas - - - -	Coonoor - - - -	12	
Rajah of Poonganoor - - - -	Poonganoor - - - -	12	
Major Grant - - - -	Wellington - - - -	226	
Messrs. Thomson, Shaw & Co. - - - -	Poonganoor - - - -	28	
Mr. J. H. Trinson - - - -	- ditto - - - -	31	
Dr. Muller - - - -	Melbourne - - - -	28	
Mr. Tyrrell - - - -	Mysore - - - -	12	
Dr. Sayers - - - -	Vellore - - - -	12	
Major C. P. Taylor - - - -	Ootacamund - - - -	5,250	
Dr. Wilson - - - -	- ditto - - - -	6	
Mr. Schnarie - - - -	- ditto - - - -	15,000	
Captain Fuller - - - -	Coonoor - - - -	268	
Mr. Drummond - - - -	Ootacamund - - - -	224	
Captain Jennings - - - -	- ditto - - - -	1,756	
Lieut. H. B. Montmorency - - - -	Bangalore - - - -	6	
Mr. McHutchin - - - -	Ootacamund - - - -	3	
Colonel Molesworth - - - -	- ditto - - - -	6	
Mr. C. Gray - - - -	Coonoor - - - -	12	
Mt. H. B. Liddell - - - -	Ootacamund - - - -	12	
Mr. Minchin - - - -	Wynad - - - -	1,600	
His Excellency the Governor - - - -	Vizagapatam - - - -	35	
Mr. R. F. Phillips - - - -	Kotagherry - - - -	1,117	
Colonel Cooke - - - -	- ditto - - - -	24	
Mr. G. J. Glasson - - - -	Wynad - - - -	1,000	
Dr. Macpherson - - - -	Mercara - - - -	400	
Mr. W. H. Kerr - - - -	Coorg - - - -	3,100	
Mr. James - - - -	Ootacamund - - - -	1,000	
Colonel Whish - - - -	Bengal - - - -	82	
TOTAL Number of Plants - - - -		46,106	

Ootacamund,
12 October 1864.

(signed) *W. G. McIvor,*
Superintendent Government Chinchona Plantations.

— No. 31.—

From the Government of Madras to the Secretary of State for India.

Madras, 25 November 1864.

WE have the honour to forward for your information the accompanying tabular Report on the number, condition, &c., of the Chinchona plants on the Neilgherries, on the 31st October 1864.

Enclosure in No. 31.

REPORT on the Number, Distribution, and Condition of Chinchona Plants on the Neilgherries, on the 31st October 1864.

No. of Species.	Botanical Names.	Commercial Names.	Number of Plants.	Value per Lb. of Dry Bark in the London Market.		REMARKS.
				s. d.	s. d.	
1	<i>C. succirubra</i> - -	Red Bark - -	121,646	2 6	to 8 9	The number of plants permanently planted out in the plantations has been reduced from 178,551 to 165,351, in consequence of 8,200 transplanted plants being removed from the Pycara avenue to the nursery beds on the eastern side of the hill, in obedience to instructions conveyed in G. O. No. 1,794, dated 28th September 1864. The increase by propagation is 15,800, being 7,223 plants under the average of the last six months, making the total number of plants at the end of the month 457,988.
2	<i>C. Calisaya</i> - -	Yellow Bark - -	2,527	2 10	to 7 -	
3	<i>C. officinalis</i> , var. <i>Condaminea</i> (<i>C. Uritusinga</i>).	Original Loxa Bark	1,787	2 10	to 7 -	
4	<i>C. officinalis</i> , var. <i>Bonplandiana</i> (<i>C. Chahuarguera</i>).	Select Crown Bark -	300,817	2 10	to 7 -	
5	<i>C. crespilla</i> - -	Fine Grey Bark	2,304	2 10	to 6 -	
6	<i>C. lancifolia</i> - -	Pitayo Bark - -	20	1 8	to 2 10	
7	<i>C. nitida</i> - -	Genuine Grey Bark -	8,494	1 8	to 2 9	
8	<i>C. species</i> without name.	Fine Grey Bark - -	2,786	1 8	to 2 10	
9	<i>C. micrantha</i> - -	Grey Bark - -	13,854	1 8	to 2 9	
10	<i>C. Peruviana</i> - -	Finest Grey Bark - -	3,378	1 8	to 2 10	
11	<i>C. Pahudiana</i> - -	Unknown - -	425	Worthless.		
TOTAL Number of Plants - - -			457,988			

TABLE II.

MEMORANDUM of the Growth of Eleven Plants of *C. succirubra*, planted on the Second Denison Plantation, at Neddivuttum, on 30 August 1862.

Number of Plants.	Height in Inches when Planted on 30 August 1862.	Height in Inches on 30 September 1864.	Height in Inches on 31 October 1864.	Height in Inches during October 1864.	By whom Planted.
1	23	105	106	1	His Excellency Sir William Denison.
2	18½	96	99	3	
3	19	96	102	6	
4	15	96½	97	0½	J. W. Brecks, Esq.
5	27	118½	114½	1	
6	20	85	86½	1½	Dr. Sanderson.
7	20	104½	106½	2	
8	18	100½	105½	5	J. D. Sim, Esq.
9	20	103	108	5	
10	20	106½	110	3½	Lieutenant McLeod.
11	18	85½	96	0½	P. Grant, Esq.
12	-	48	51	3	Plant cut down for bark.

TABLE II. exhibits the growth of eleven plants of Chinchona succirubra, planted out by His Excellency the Governor, and other gentlemen at Neddivuttum, on the 30th August 1862. The average growth of these plants during the month is 2½ inches, being ½ an inch above the growth of last month.

One of the two plants cut down on the 20th of March 1863 for the bark submitted to Mr. Howard for analysis, has made strong shoots of 51 inches in height, giving the growth of 3 inches during the month.

TABLE III.

SHOWING the Height of Twelve Plants of *C. officinalis*, planted on the Dodabetta Plantation at Ootacamund, on the 30th September 1863.

Number of Plants.	Height in Inches when Planted on 30 September 1863.	Height in Inches on 30 September 1864.	Height in Inches on 31 October 1864.	Growth in Inches during October 1864.	REMARKS.
1	22	59	61½	2½	The twelve plants of <i>Chinchona officinalis</i> (a shrubby species), on the Dodabetta Plantation, gives an average growth of 2½ inches or ½ inch under the growth of last month.
2	16½	50	53	3	
3	31½	64	66½	2½	
4	25	63½	66	2½	
5	24½	60	63	3	
6	31½	60½	70	3½	
7	25	59	62	3	
8	27	60½	63	2½	
9	26½	68½	71	2½	
10	23½	62	65½	3½	
11	26½	62½	66	3½	
12	26	63½	66	2½	

TABLE IV.

Register of Chinchona Plants Distributed.

NAMES.	STATION.	Number of Plants.
Mr. F. N. Maltby	Travancore	16
Dr. Junghuhn	Java	56
Mr. A. R. Lascelles	Ootacamund	12
Mr. M. Anderson	Jamaica	2
Dr. Wiebe	Bombay	10
Dr. T. Anderson	Calcutta	554
Dr. Jamieson	Saharanpore	107
Professor Lees	Calcutta	547
Rajah of Travancore	Travancore	521
Major Morgan	Ootacamund	1,534
Mr. E. T. Fitzgerald	Calcutta	405
Mr. J. W. B. Money	- ditto -	1,369
Dr. W. Bourne	- ditto -	532
Captain Cox	Wynad	6
Mr. Hollock	- ditto -	2
Mr. T. Sheffield	Ootacamund	12
Dr. F. Day	Cochin	100
Mr. Brown	Tellicherry	12
Mr. J. Hall	Ootacamund	144
Mr. J. Knop	- ditto -	18
Captain Lees	Bengal	281
Mr. W. H. Rayne	Manantoddy	424
Reverend — Sawyer	Ootacamund	1,018
M. Frend	- ditto -	112
Mr. Hollock	- ditto -	1
M. J. Perie	Seegoor	12
Colonel Scott	Ootacamund	1,126
Mr. Berend	Cachar	275
Reverend J. Hunter	Coonoor	12
Mr. J. Mullaly	- ditto -	24
Mr. W. H. Stanes	- ditto -	262
Colonel R. Cooper	Kotagherry	12
Mr. F. Cockburn	- ditto -	12
Colonel Woodfall	Coonoor	12
Mr. C. Anderson	- ditto -	24
Colonel Angelo	Ootacamund	12
Reverend E. Laseron	- ditto -	12
Captain R. N. Taylor	Coorg	96
Major W. Agnew	Assam	139
Mr. V. H. Lvinge	Madura	12
Chief Commissioner	Nagpore	23
Mr. Fletcher	Ootacamund	24
Gool Mahomed	- ditto -	20

The number of plants issued to the public is 3,103, making the total number of plants distributed 49,209.

TABLE IV.—REGISTER of Chinchona Plants Distributed—*continued.*

NAMES.	STATIONS.	Number of Plants.	REMARKS.
General McCleverty	New Zealand	23	
Mr. W. Robinson	Kotagherry	30	
Mr. Crake	Wynad	12	
Mr. H. R. Dawson	Seegoor	12	
Captain Mann	Coorg	48	
Mr. E. Roberts	Ootacamund	530	
Mr. H. Russell	Wynad	12	
Rev. — Wait	Coonoor	2	
Mr. H. de Facien	Katary	6,821	
Collector of Belgaum	Belgaum	28	
Collector of Honore	Honore	28	
Dr. Ross	ditto	15	
His Excellency the Governor	Bombay	158	
Mr. H. Hinde	Wynad	12	
Mr. E. B. Thomas	Coonoor	12	
Rajah of Poonganoor	Poonganoor	12	
Major Grant	Wellington	226	
Messrs. Thomson, Shaw & Co.	Poonganoor	28	
Mr. J. H. Trinson	ditto	31	
Dr. Muller	Melbourne	28	
Mr. Tyrrell	Mysore	12	
Dr. Sayers	Vellore	12	
Major C. P. Taylor	Ootacamund	5,250	
Dr. Wilson	ditto	6	
Mr. Schnarrie	ditto	15,000	
Captain Fuller	Coonoor	268	
Mr. Drummond	Ootacamund	224	
Captain Jennings	ditto	1,756	
Lieut. H. B. Montmorency	Bangalore	6	
Mr. McHutchin	Ootacamund	3	
Colonel Molesworth	ditto	6	
Mr. C. Gray	Coonoor	12	
Mr. H. Liddell	Ootacamund	12	
Mr. Minchin	Wynad	1,000	
His Excellency the Governor	Vizagapatam	35	
Mr. R. F. Phillips	Kotagherry	1,117	
Colonel Cooke	ditto	24	
Mr. G. J. Glasson	Wynad	1,000	
Mr. W. H. Kerr	Coorg	3,100	
Mr. James	Ootacamund	1,000	
Colonel Whish	Bengal	82	
Dr. Macpherson	Mercara	400	
Major Sweet	Katary	102	
Captain Campbell	Bangalore	6	
Royal Botanical Gardens	Mauritius	36	
Hon. W. R. Arbuthnott	Madre	93	
Hamilton Maxwell, Esq.	Bombay	50	
Mr. C. Smith	Wynad	22	
Total Number of Plants		49,209	

Ootacamund,
21 November 1864.

(signed) *W. G. McIvor,*
Superintendent, Government Chinchona Plantations.

— No. 32. —

From the Government of Madras to the Secretary of State for India.

Madras, 22 December 1864.

WE have the honour to forward for your information the accompanying Tabular Report on the number, condition, &c., of the Chinchona plants on the Neilgherries, on the 30th November 1864.

Enclosure in No. 32.

REPORT on the Number, Distribution, and Condition of Chinchona Plants on the Neilgherries, on 30 November 1864.

No. of Species.	Botanical Names.	Commercial Names.	Number of Plants.	Value per Lb. of Dry Bark in the London Market.		REMARKS.
				s. d.	s. d.	
1	<i>C. succirubra</i> - -	Red Bark - -	129,811	2 6	to 8 9	The planting season having passed, the number of plants permanently planted out in the plantations remain the same as in the end of last month, namely, 165,351. The increase by propagation is 20,606, being 376 plants under the average of the last six months, making the total number of plants at the end of the month 475,646.
2	<i>C. Calisaya</i> - -	Yellow Bark - -	2,508	2 10	to 7 -	
3	<i>C. officinalis</i> , var. <i>Condamenia</i> (<i>C. Uritusinga</i>).	Original Loxa Bark	2,255	2 10	to 7 -	
4	<i>C. officinalis</i> , var. <i>Bonplandiana</i> (<i>C. Chahuarguera</i>).	Select Crown Bark -	309,508	2 10	to 7 -	
5	<i>C. crespilla</i> - -	Fine Crown Bark - -	2,357	2 10	to 6 -	
6	<i>C. lancifolia</i> - -	Pitayo Bark - -	26	1 8	to 2 10	
7	<i>C. nitida</i> - -	Genuine Grey Bark -	8,494	1 8	to 2 9	
8	<i>C. Species</i> without name.	Fine Grey Bark - -	2,786	1 8	to 2 10	
9	<i>C. micrantha</i> - -	Grey Bark - -	14,104	1 8	to 2 9	
10	<i>C. Peruviana</i> - -	Finest Grey Bark - -	3,872	1 8	to 2 10	
11	<i>C. Pahudiana</i> - -	Unknown - -	425	Worthless.		
TOTAL Number of Plants - - -			475,646			

TABLE II.

MEMORANDUM of the Growth of Eleven Plants of *C. succirubra*, Planted on the Second Denison Plantation, at Nedddivuttum, on 30 August 1862.

Number of Plants.	Height in Inches when Planted on 30 August 1862.	Height in Inches on 31 October 1864.	Height in Inches on 30 November 1864.	Growth in Inches during November 1864.	By whom Planted.
1	29	106	111	5	His Excellency Sir W. Denison.
2	16½	99	100½	1½	
3	19	102	104½	2½	
4	15	97	98½	1½	
5	27	114½	117	2½	J. W. Breeks, Esq.
6	20	86½	88	1½	
7	20	106½	107½	1	Dr. Sanderson.
8	18	105½	109	3½	
9	20	108	111½	3½	J. D. Sim, Esq.
10	20	110	112½	2½	
11	18	96	98	2	Lieutenant McLeod.
12	-	51	52	1	

Table II. exhibits the growth of 11 plants of *Chinchona succirubra* planted out by his Excellency the Governor and other gentlemen, at Nedddivuttum, on the 30th August 1862. The average growth of these plants during the month is 2½ inches, being ½ inch below the growth of last month.

One of the two plants cut down on the 20th of March 1863 for bark, submitted to Mr. Howard for analysis, has made strong shoots of 52 inches in height, giving the growth of one inch during the month.

J. W. Breeks, Esq.
Dr. Sanderson.
J. D. Sim, Esq.
Lieutenant McLeod.
P. Grant, Esq.
Plant cut down for bark.

TABLE III.

Showing the Height of Twelve Plants of *C. officinalis*, planted on the Dodabetta Plantation, at Ootacamund, on the 30th September 1863.

Number of Plants.	Height in Inches when Planted on 30 September 1863.	Height in Inches on 31 October 1864.	Height in Inches on 30 November 1864.	Growth in Inches during November 1864.	REMARKS.
1	22	61½	65	3½	The 12 plants of <i>Chinchona officinalis</i> (a shrubby species), on the Dodabetta Plantation, give an average growth of 3 inches, or ¼ inch above the growth of last month.
2	16½	63	55½	2½	
3	31½	66½	70	3½	
4	25	66	72	6	
5	24½	63	66½	3½	
6	31½	70	73	3	
7	25	62	65	3	
8	27	63	65½	2½	
9	26½	71	72½	1½	
10	23½	65½	68	2½	
11	26½	66	69½	3½	
12	25	66	69	3	

TABLE IV.

REGISTER of Chinchona Plants Distributed.

NAMES.	STATIONS.	Number of Plants.
Mr. F N. Maltby	Travancore	16
Dr. Junghuhn	Java	56
Mr. A. R. Lascelles	Ootacamund	12
Mr. M. Anderson	Jamaica	2
Dr. Wiche	Bombay	10
Dr. T. Anderson	Calcutta	554
Dr. Jamieson	Saharanpore	107
Professor Lees	Calcutta	547
Rajah of Travancore	Travancore	521
Major Morgan	Ootacamund	1,534
Mr. E. T. Fitzgerald	Calcutta	558
Mr. J. W. B. Money	- ditto	1,369
Dr. W. Bourne	- ditto	532
Captain Cox	Wynad	6
Mr. Hollock	- ditto	2
Mr. T. Sheffield	Ootacamund	12
Dr. F. Day	Coonoor	100
Mr. Brown	Tellicherry	12
Mr. J. Hall	Ootacamund	144
Mr. J. Knop	- ditto	18
Captain Lees	Bengal	281
Mr. W. H. Rayne	Manantoddy	24
Rev. — Sawyer	Ootacamund	1,018
Mr. Friend	- ditto	112
Mr. Hollock	- ditto	1
Mr. J. Pierie	Seegoor	12
Colonel Scott	Ootacamund	1,226
Mr. Berend	Cachar	275
Rev. J. Hunter	Coonoor	12
Mr. J. Mullaly	- ditto	24
Mr. W. H. Stanes	- ditto	1,262
Colonel R. Cooper	Kotagherry	12
Mr. F. Cockburn	- ditto	12
Colonel Woodfall	Coonoor	12
Mr. C. Anderson	- ditto	24
Colonel Angelo	Ootacamund	12
Rev. E. Laseyron	- ditto	12
Captain R. N. Taylor	Coorg	96
Major W. Agnew	Assam	139
Mr. V. H. Levinge	Madura	12
Chief Commissioner of Nagpore	Nagpore	28
Mr. Fletcher	Ootacamund	24
Gool Mahomed	- ditto	20

The number of plants issued to the public is 2,948, making the total number of plants distributed 62,167.

TABLE IV.—Register of Chinchona Plants Distributed—*continued.*

NAMES.	STATIONS.	Number of Plants.	REMARKS.
General McCleverty	New Zealand	23	
Mr. W. Robinson	Kotagherry	18	
Mr. Crake	Wynad	12	
Mr. H. R. Dawson	Seegoor	12	
Captain Mann	Coorg	48	
Mr. E. Roberts	Ootacamund	30	
Mr. H. Russell	Wynad	12	
Rev. — Wait	Coonoor	2	
Collector of Belgaum	Belgaum	28	
Collector of Honore	Honore	28	
Dr. Ross	- ditto	15	
His Excellency the Governor	Bombay	158	
Mr. H. Hinde	Wynad	12	
Mr. E. B. Thomas	Coonoor	12	
Rajah of Poonganoor	Poonganoor	12	
Major Grant	Wellington	226	
Messrs. Thomas, Shaw & Co.	Poonganoor	28	
Mr. J. H. Trinson	- ditto	31	
Dr. Muller	Melbourne	28	
Mr. Tyrrell	Mysore	12	
Dr. Sayers	Vellore	12	
Major C. P. Taylor	Ootacamund	5,250	
Dr. Wilson	- ditto	6	
Mr. Schnarrie	- ditto	15,000	
Captain Fuller	Coonoor	266	
Mr. Drummond	Ootacamund	224	
Captain Jennings	- ditto	1,756	
Lieut. H. B. Montmorency	Bangalore	6	
Mr. McHutchin	Ootacamund	3	
Colonel Molesworth	- ditto	6	
Mr. C. Gray	Coonoor	12	
Mr. H. B. Leddell	Ootacamund	12	
Mr. Minchin	Wynad	1,600	
His Excellency the Governor	Vizagapatam	35	
Mr. R. F. Phillips	Kotagherry	1,117	
Colonel Cooke	- ditto	24	
Mr. G. J. Glasson	Wynad	1,000	
Dr. Macpherson	Mercara	400	
Mr. W. H. Kerr	Coorg	3,100	
Mr. James	Ootacamund	1,000	
Colonel Whish	Bengal	82	
Mr. K. Mair	Calcutta	1,180	
Mr. W. Shakespear	- ditto	61	
Mr. E. E. Meakin	- ditto	168	
Mr. C. Ackland	- ditto	150	
Mr. K. McIver	- ditto	124	
Mr. Havelock	Ootacamund	12	
Mr. W. Robinson	Kotagherry	12	
Mr. H. De Facien	Kartairy	6,821	
Major Sweet	- ditto	102	
Captain Campbell	Bangalore	6	
Royal Gardens	Mauritius	36	
Hon. W. R. Arbuthnot		98	
Mr. H. Maxwell	Bombay	50	
Mrs. C. Smith	Wynad	22	
Mr. Rayne	Manantoddy	400	
Mr. E. Roberts	Coorg	500	
TOTAL Number of Plants		52,157	

Ootacamund,
17 December 1864.

(signed) *W. G. McIvor,*
Superintendent Government Chinchona Plantations.

— No. 33. —

From the Government of Madras to the Secretary of State for India.

Madras, 11 January 1865.

1. We have the honour to forward for your information the accompanying papers respecting the conduct of Mr. McIvor, the Superintendent of the Chinchona Plantations, in having, contrary to our orders, cut an avenue through the forest in the immediate neighbourhood of the Pykara waterfalls.

2. Mr. McIvor has rendered such important service in connection with the introduction of the chinchona into India, that we felt much regret in recording our serious dissatisfaction with him in this matter, but the tone and tenor of his letter of the 11th October last left us no alternative but to vindicate our authority in decided terms.

3. Mr. McIvor has since apologised for this very reprehensible letter, and withdrawn his resignation; we need not therefore dwell further on it.

4. Independent of the occurrence now reported, we feel very strongly the necessity of having at our command a person competent to take charge of the plantations, in the event of Mr. McIvor's death, illness, or resignation. The superintendents of the different plantations, though doubtless quite qualified for their subordinate positions, are not competent to undertake the charge of the entire experiment; and the interests at stake quite warrant the addition to the establishment of a deputy superintendent on a salary sufficiently liberal to ensure the peculiar qualifications necessary.

Enclosure 1, in No. 33.

From Lieutenant Colonel *Douglas Hamilton*, 44th Regiment Native Infantry, on special duty visiting Hill Ranges, to *A. J. Arbuthnot*, Esq., Chief Secretary to Government, Fort St. George.

Ootacamund, 2 January 1863.

1. REFERRING to my letter, dated 29th October 1862, in which I proposed visiting the Bullerungam Mountains in Mysore, I have the honour to state that from information received regarding a range of hills near Manantoddy, called the Bramagherries, situated in proximity to the Wynaad coffee estates on the borders of the Heggadavencotta talook, in the Astragram division, on the summit of which I understand there is a fine plateau at an elevation of about 6,000 feet above the level of the sea, easy of access, it may be considered of more importance, with reference to their locality, that in the first instance this range, hitherto I believe unexplored, should be visited and reported on; and which, with the sanction of Government, I pur use doing during the present cold season.

2. I trust it will not be considered out of place if I mention, for the consideration of Government, that the site lately selected for chinchona operations, in the valley of the Pykara river, will materially affect one of the most picturesque and beautiful spots on the Neilgherries, the hanging wood over the falls of the river being doomed to destruction, thereby utterly depriving the scene of its chief ornament. The Pykara Falls is one of the sights on the hills, much appreciated by residents and visited by strangers.

3. I fear, however, in bringing this to notice, I may be too late, as I perceive operations have already commenced, but I deem it advisable to mention it for the information of Government, as a large portion of the same shola at the back of the hill, in the eastern slope, seems equally well adapted for the purpose, and I would venture to suggest that the whole of the forest within sight of the falls may, if possible, be preserved intact.

Enclosure 2, in No. 33.

Order of the Madras Government, 6 January 1863.

1. THE attention of the Collector of Coimbatore will be drawn to the representation made by Lieutenant Colonel Hamilton, regarding the operations now in progress for opening a chinchona plantation in the neighbourhood of the Pykara waterfall. Mr. McIvor was some time ago instructed to leave a sufficient fringe of wood along the banks of the river; but, from information which has reached the Government, it is understood that a clearing has been made, and a hut erected immediately in sight of the lower water-

fall. Mr. McIvor will now be directed, by telegraph, to suspend his felling operations until the locality can be visited by the Collector, who will inspect it with as little delay as possible in company with Mr. McIvor, and will select a site for the plantation sufficiently remote from the river, not to interfere with the scenery about the falls. Colonel Hamilton, it is observed, speaks of there being a large portion of the same wood on the eastern slope of the hill above the falls which appears to be equally adapted for chinchona cultivation.

2. Ordered, that the following telegram be despatched:—

“ Stop felling the wood near the Pykara Falls until further orders. This order must be acted on immediately.”

(signed) *J. D. Sim,*
Secretary to Government.

Enclosure 3, in No. 33.

From *W. G. McIvor, Esq.,* Superintendent, Government Chinchona Plantations, to
J. D. Sim, Esq., Secretary to Government, Revenue Department, Madras.

Sir, Ootacamund, 7 January 1863.

1. LAST evening I had the honour to receive the telegram marginally noted;* and, as there appears to be some misapprehension, I hasten to inform the Government that not a tree has been felled near the Pykara Falls since November last, and then only a space of one acre for a nursery; the reason why I selected this spot for the first nursery was that it was considerably removed from the forest we intended to fell for the chinchona plantations, and consequently the plants would not be damaged by the fire while burning the forest; it was also convenient for watering. Although this small piece was felled in November, it is only now sufficiently dry to admit of the operations of lopping and burning, and preparing the nursery beds; a few men at the present moment are employed at this work, and perhaps visitors to the falls have erroneously conceived these operations to be the precursor of the destruction of the entire forest. Such, however, is not the case, as it never was intended to fell another tree on the waterfall face of the hills.

2. The forest now being felled for the chinchona plantations is not within sight of the waterfalls, being on the opposite face of the hills, viz., north and east, while the forest on the waterfall side faces west and south, being an exposure unsuited for the growth of chinchonas, and consequently it never was intended to fell this forest for a chinchona plantation.

3. The formation of the chinchona plantation in the neighbourhood of the falls, so far from detracting from the charms nature has given to this spot, will, I submit, vastly add to them, inasmuch as the roads formed for the plantations will render the waterfalls easily accessible, and available for hundreds who under present circumstances cannot visit them.

Enclosure 4, in No. 33.

From *P. Grant, Esq.,* Collector of Coimbatore, to *J. D. Sim, Esq.,* Secretary to Government, Revenue Department.

Sir, Coimbatore, 15 January 1863.

I HAVE received Proceedings of Government, Revenue Department, and their order thereon, dated 6th January 1863, No. 7, and in accordance with the instructions contained therein have visited the proposed site for the Pykara chinchona plantation. The plantation will not be within sight of the falls, but on the eastern slope of the hill, that locality in fact pointed out by Colonel Hamilton as best suited for the purpose. The felling of the jungle is now being carried on there, and has not been interfered with pending further orders from Government, as it is of importance that it should be speedily finished, and there can be no doubt as to the judicious selection of the site. At the lower extremity of the Sholah hanging over the falls, one acre of wood was felled (in September or October I think) for a nursery, which is now being formed. No further felling was contemplated there; the nursery will be removed this year and its site planted out with chinchonas. Mr. McIvor choose this spot for the nursery, as he was afraid to form it on the side of the hill, where the plantation is to be, in case of any injury to the young plants from fire when the felled jungle is fired. I believe the precaution to be a judicious one. Mr. McIvor seems to be quite as enthusiastic in his admiration of the falls and the surrounding scenery as most people, and I venture to express an opinion that within the next twelve months they will be rendered more accessible and attractive than they have hitherto been.

* No. 8. Message received by Telegraph.

From Secretary to Government, Madras, to *W. G. McIvor, Esq.,* Ooty.

Words 21.

Stop felling the wood near the Pykara Falls until further orders. This order must be acted on immediately. 6th-17-5.

Her Majesty's Telegraph Office, 6 January 1863. (signed) *J. Knop,* Inspector in Charge.

Enclosure 5, in No. 33.

Memorandum by *A. J. Arbuthnot, Esq.*, Chief Secretary to the Government of Fort St. George.

8 August 1864.

1. HAVING a few days ago visited the Pykara waterfalls, I think it right to bring to the notice of Government that the orders passed last year, prohibiting the felling of that part of the wood which borders the river close to the falls, have been altogether disregarded. In the Order of Government in the Revenue Department, under date the 6th January 1863, consequent on a representation made by Lieutenant Colonel Hamilton in regard to the injury which would be done to the scenery at that beautiful spot by the destruction of the wood overhanging the falls, the superintendent of the chinchona plantations was directed to suspend his felling operations until the locality could be visited by the Collector who was ordered to inspect it, and to select a site for the plantation sufficiently remote from the river not to interfere with the scenery about the falls. The Collector in his reply reported that the plantation would not be within sight of the falls, but on the eastern slope of the hill; that at the lower extremity of the Shola hanging over the falls, an acre of wood had been felled for a nursery, but that no further felling was contemplated there, and that the nursery would be removed this year (1863), and its site planted out with chinchona. On this understanding, viz., that there was to be no further felling on the western slope of the hill, the Government abstained from further interference, and an order was passed to the following effect:—

“The Government are glad to find that the plantation will not affect the scenery about the Pykara Falls, within sight of which felling will not be allowed.”

2. I regret to say that, notwithstanding these orders, a large gap of from 30 to 50 yards in width has been cut through the wood, from the top of the hill to a point opposite the upper fall, utterly disfiguring the wood, and thereby destroying what was the great beauty of the view from the opposite side of the river. Moreover, the point from which the lower falls are best seen has been rendered almost inaccessible, quite so to any person not equal to considerable exertion on foot, by the felling of timber which has blocked up, and in fact obliterated, the old pathway through the wood. In the centre of the felling a riding path has been made about 12 feet in width, which is certainly an improvement on the old path, and if the clearing had been restricted to this, little or no harm would have been done; although adverting to the orders of Government, the intention of which was clearly to prohibit any felling of trees on the western slope of the hill, it seems questionable whether the superintendent was at liberty to make any such clearance without the permission of Government.

Enclosure 6, in No. 33.

ORDER of the Madras Government, 13 August 1864.

THE Governor in Council is surprised to learn that in the face of the express orders of Government, referred to in the foregoing memorandum, the Superintendent of the chinchona plantations has felled any further portion of the wood on the western slope of the hill immediately above the Pykara waterfalls. Before passing further orders on the subject, the Governor in Council resolves to call upon Mr. McIvor for an immediate explanation of his conduct.

Enclosure 7, in No. 33.

From *W. G. McIvor, Esq.*, Superintendent Government Chinchona Plantations, to *J. D. Sim, Esq.*, Secretary to Government, Revenue Department, Madras.

Sir,

Ootacamund, 30 August 1864.

I HAVE the honour to acknowledge receipt of Government Order, No. 1465, dated 13th August 1864, and beg to explain that prior to cutting the avenue through the wood near the Pykara Falls, I had the honour to submit the proposition for the consideration of his Excellency the Governor, which being approved, as per extract in the margin,* the work was commenced.

2. I also

* To His Excellency Sir *William Denison*.

The Pykara waterfalls are almost inaccessible during the rains (the time they are in greatest perfection), owing to the leeches. I have been grieved to see ladies striving to get through the jungle. I would therefore respectfully propose, with your Excellency's permission, to cut an easy avenue of about 40 yards wide, winding from the top to the bottom of the forest, with the road in the centre, and a few lines of chinchona on each side, to give sufficient space clear of underwood to keep the leeches from the road. This I think would add much to the attractions of Pykara, and make the falls accessible at all seasons. A few arbours might also be placed on the points commanding the finest views.

Ootacamund, 18 October 1863.

(signed) *W. G. McIvor*.

Madras, Government House, 19 October 1863.

I have no objections to the arrangements you propose for Pykara; it will be a great improvement.

(signed) *W. Denison*.

2. I also respectfully beg to explain that I considered the Order of Government of 6th January 1863 to refer to the wood "overhanging the falls" where there had been no felling whatever, except to open three narrow vistas to enable visitors to obtain a view of the falls from different points. It is only through this wood that we can communicate with our plantation on the eastern side, and I did not consider that the Order of Government forbade opening a road through this part of the wood, as without this our plantation on the eastern side could not have been worked, as the natives would not pass through the wood during the rainy season on account of the leeches.

3. I must therefore disavow, both in intention and in fact, the accusation brought against me, that the Orders of Government above noted "have been altogether disregarded."

4. The work in question is as yet in an unfinished state, and as such does not appear to the advantage which it will shortly do; the greater part of the avenue is already planted with chinchonas, which will shortly present a far more beautiful appearance than the useless trees they replace, while the road in the centre of the avenue affords easy access to both the upper and lower falls. Any impression to the contrary must have arisen from following the old track instead of the new line of road.

Enclosure 8, in No. 33.

Order of the Madras Government, 28 September 1864.

1. Mr. McIVOR was not warranted in interpreting the general assent given by his Excellency the Governor to his indefinite proposal (unaccompanied by any sketch or plan showing the locality and the proposed operations), as equivalent to formal permission to depart from a plain and positive order issued by his Excellency in Council, after full consideration.

2. The Governor in Council now prohibits Mr. McIvor from interfering in any way with the western side of the hill, which will be placed exclusively under the Forest Department. The injury effected to the forest cannot be repaired by planting Australian or other trees, and the cleared spots had better be left to nature. The chinchonas should be removed to the plantation if this can be done without material danger, as they will not harmonise with the surrounding forest, otherwise the assistant conservator will take charge of them.

3. The assistant conservator will leave a sufficient breadth of pathway for Mr. McIvor's labourers, reducing its steepness, and widening it where necessary, without however cutting down any more timber. Mr. McIvor will distinctly understand that he is henceforth restricted to the use of the path for himself and his labourers, and he will incur the serious displeasure of Government if he disobeys these orders. It would be well if the assistant conservator could provide other means of access to the chinchona plantation on the eastern side of the hill.

Enclosure 9, in No. 33.

From *W. G. McIvor, Esq.*, Superintendent, Government Chinchona Plantations, to
J. D. Sim, Esq., Secretary to Government, Revenue Department, Fort St. George.

Sir,

Ootacamund, 11 October 1864.

1. I HAVE the honour to acknowledge the receipt of the Order of Government, No. 1794, dated 28th ultimo, directing the removal of the chinchona plants from the Pykara avenue, and henceforth restricting myself and labourers to the use of the path.

2. With reference to paragraph 1, while waiving the direct permission of his Excellency the Governor, obtained on a proposal which clearly defined what was intended, and what has literally been carried out in cutting the avenue leading past the Pykara Falls, to the "Wood" plantation, I do with due deference and respect, most distinctly and emphatically disavow that, in forming the road, I knowingly departed "from a plain and positive order issued by his Excellency in Council after full consideration," no order to the above purport ever having reached me. Hence it may be possible that the memorandum of the Honourable A. J. Arbuthnot has induced the Government to place on their minutes on this subject an interpretation originally never intended, as their orders refer specifically to felling within sight of the falls, and not in any way restricting me from making roads to the plantations, all orders from the Government on this subject having been correctly and literally carried out, according to the best of my judgment. The telegram and order noted in the margin, were the first I had the honour to receive, and I beg to observe that the fringe of wood along the banks of the river had not been interfered with, and that the felling of the avenue cannot be seen from either the upper or lower waterfall.

In my letter under date 7th January 1863, No. 80, paragraph 3, I brought to the notice of Government my intention to form roads to the plantation, passing the waterfalls, and as these roads could not be cut without felling a portion of the forest, I submit that had such been opposed to the views of Government, I should have been instructed to that effect, their silence on the subject being naturally interpreted by me into an approval; I am therefore at a loss to know on what grounds the charge has been brought against me of having disobeyed the orders of Government, in carrying out a work so essential to the maintenance of the plantation. The avenue in question, had the Government permitted it to be completed, would have added greatly to the attractions of the falls and the beauty of the scenery, inasmuch as it is the grandeur of nature combined with art, which conveys the most pleasing impressions to the mind. This is well understood by all artists of note, and is in fact the secret upon which their reputations have been built, as what would be the effect, or value of a picture of the Swiss Alps were it not for the cottage judiciously introduced into the scene, the green patch of cultivation, and the goats grazing in the foreground. These objects form the life of the picture, and the reason of their introduction is to convey the pleasing impression, that in combination with the grandeur of nature, it contributes to the comforts of the human race; while scenery however grand and majestic, without these attractions, is dead, and leaves upon the mind the painful impression of desolation, the eye vainly endeavouring to rest upon an object, conveying the idea of comfort and happiness to mankind.

3. What has been done in opening out this avenue is already appreciated by the community, as within the last two months since the road has been finished, there have been more visitors to the falls than in the twelve previous months. The average number of visitors to the falls during 1862 and 1863 varied from 32 to 40.

4. Immediately on receipt of the Government Order, and in obedience to paragraph 2, I proceeded to the "Wood" plantation, and placed every available hand to remove the Chinchona plants (upwards of 8,000, many of which had been planted for more than six months) from the avenue to the nursery beds on the eastern side of the hill. While I do not presume to solicit the favour of a reconsideration of this portion of the minute under reply, I feel confident that I shall not incur the displeasure of Government, by bringing to their notice my conscientious conviction, that this part of their order directs the removal of plants, which shortly would have formed one of the most valuable, beautiful, and interesting avenues in the world, permitting in its stead a growth of noxious weeds, this conviction being formed on the following facts, first, that several species of Chinchona stand pre-eminent as the most valuable of all vegetable products, and the avenue in question was planted with the best of these; second, that in point of beauty the Chinchona tree is inferior to none, Mr. Markham describing it as the most "beautiful and fragrant tree" of South America, Mr. Spruce as the "queen of the forest," and every traveller in South America, from the time of Humboldt up to this date, being unanimous in this opinion." What then could exceed the beauty of an avenue, nearly two miles in length, composed of such trees? Third, that the cultivation of these plants being in its infancy is one in which all scientific men take a great interest, and this avenue extending as it does from an elevation of 6,500 feet to 3,400 feet, would have shown, within a comparative short distance, the various effects of altitude upon the different species, and thus practically illustrate a most important and interesting fact; fourth, that the forests on these hills when once felled and burned, if "left to nature," not one tree in a hundred will ever grow again, the ground becoming covered by a growth of strobilanthes and weeds, principally composed of the noxious *Solanum giganteum*.

5. The Government observe that the Chinchonas "will not harmonize with the surrounding forest." I am not aware of the arguments adduced to cause this impression on the Government, but submit that in point of fact, nothing can be more erroneous, inasmuch as the indigenous forests on the Neilgherries are composed principally of chinchona-ceous plants, so identical in their general resemblance with the Chinchona Uritusinga, C. Crespilla, and C. Condaminea, that it requires the experienced eye of a botanist upon close examination to distinguish the one from the other; hence, had the cause of the removal of the plants been attributed to too great harmony it might have been tenable, on the ground that this similarity would amount to monotony in the scenery, were it not that the leaves of the "red" and "grey" barks are larger and richer in colour than the majority of jungle trees, and in planting the avenue this was taken advantage of in such a manner as would have produced an effect for richness and beauty altogether unequalled in Neilgherry scenery.

6. From the date of the introduction of the Chinchona plants, objections tending to impede our progress have been continually advanced without reason or reflection; these hitherto I have cheerfully combated, being confident in the correctness of my own views, and in the hope that when I had developed these to the satisfaction of Government, as has already been done, I should be secure in their confidence and protection against further interference. The wording of the Order under reply has deprived me of this hope, and I see with apprehension objections arising from the Government itself, of so potent a nature, as to destroy in a few days the labour of years; to explain my meaning I would observe, that had I literally carried out the restrictions conveyed in paragraph 3, of the Government Order, I would have had to report to-day a loss of about 40,000 plants. Truly a more effectual plan for the destruction of the plantation could not have been conceived, for the reason that any attempt on my part to restrict my labourers to the path

would cause their immediate desertion from the plantation, as the men have hitherto been allowed to diverge from the path to obtain water, collect firewood, and other innocent purposes; to deprive the labourers of these privileges is to deprive us of their services, and at the present moment we have a newly formed nursery of about 40,000 plants, depending for their existence on the attendance of these labourers, and great as would be the damage and loss in this respect, in other ways the restrictions reduce to a certainty the total destruction both of the plantation and nursery, from the fact, that no water originates on the eastern side, the water for the irrigation of the nurseries and plantation being brought from the Pykara river, in a channel through the forest, on the western side of the hill; this channel becomes frequently choked up by accident, such as the falling of wood, passing of wild animals, &c., and although this water is indispensably necessary for the daily existence of the plants in the nurseries, and for the preservation of the plants in the plantation during the dry season, yet the Order of Government clearly indicates, that if I were to direct the men to deviate from the path to clear out this watercourse, and thus obtain that which is necessary to the very existence of the plantation, I would be guilty of a trespass, to be visited by "the serious displeasure of Government;" hence, restrictions productive of such consequences greatly discourage me, especially as the conviction is forced upon my mind, that the more perfectly I develop the success of this undertaking, the more serious will be the opposition I shall have to encounter in consequence of its arising principally from a covert feeling of class prejudice; another cause exists among the admirers of natural scenery, who conceive that Chinchona cultivation will spoil the beauty of the Neilgherries, while an equally erroneous impression exists among the members of the service who take an interest in sporting pursuits, that Chinchona cultivation will drive away the game; hence their opposition. The memorandum of the Honourable A. J. Arbuthnot, Chief Secretary to Government, owes its origin to at least one of the above influences, that gentleman having frequently asserted that the Chinchona would be the ruin of the Neilgherries, by causing the felling of the natural forests. Holding such to be the case, it is to the Right Honourable the Secretary of State for India, in Council, that the onus of the introduction of these plants is to be attached, and I submit it would have been more dignified in Mr. Arbuthnot to have brought his accusation direct against that honourable body, they being in a much better position to vindicate their proceedings than a humble individual like myself.

7. In January last Mr. Arbuthnot was aware of the opening out of the avenue and road in question, and it is much to be regretted that it was not at the time brought to the notice of Government, and thus have saved considerable expense and great waste of labour.

8. The road in question has been roughly cut out and passable for laden bullocks for the last three months; it is now finished (with the exception of 70 yards in one place, and 20 in another), effectually drained and bridged, and near the falls laid out in garden style, with grass borders, &c.; before this road was opened we could neither obtain labour nor supplies for the plantation, now we can command abundance of both; this road was further intended to connect the Neddivuttum plantations by bridging the river, and this would have enabled us to draw labour and supplies for the Neddivuttum plantations from the eastern side during the western monsoon, as at this season communication with the Neddivuttum plantations is cut off; this road also, when connected, would much reduce the labour of superintendence and cost of working the plantations.

9. I refrain from troubling the Government with farther details of the injury their restrictions will cause to the plantations, submitting it to be understood, that unless I possess the power of maintaining in good order the roads and water-courses connected with the same, diverting and altering the latter when necessary, it is impossible for me to keep up labourers and establishments, or to perform the works either to the satisfaction of the Government or myself. Under these circumstances, I hold myself released from the responsibility originally placed upon me by the Government, in connection with the Chinchona operations.

10. The restrictions placed upon me and my labourers in paragraph 3, are such as the Government have never placed upon the common native traveller on their highways, and I feel this the more when applied to myself and labourers on a road constructed for our sole benefit, combined with the fact, that in carrying out these instructions there is no object to be gained, as either myself or my labourers diverging from the path into a waste forest could not be productive of injury; I am therefore at a loss to comprehend the meaning of the severity of the restrictions, except indeed it be to render their violation inevitable, and thus subject me at any moment to dismissal with disgrace, on a plea of disobedience of orders; and however unwilling I am to detach myself from this important undertaking at the present interesting and in some respects still critical period of operations, I see with concern and apprehension that my professional reputation demands it; I therefore most respectfully solicit the permission of your honourable Government and the Secretary of State for India in Council to retire from the service, on such gratuity, pension or award, as I may be considered entitled to after 17 years' arduous and successful labour, much of which has been of a special nature, and for which I have had the honour to receive the highest testimony to my zeal, ability and integrity from your honourable Government, the Governor General, and the Right Honourable the Secretary of State for India.

Enclosure 10, in No. 33.

MEMORANDUM.

LETTER from Mr. *W. G. McIvor*, Superintendent, Government Chinchona Plantations.

Dated 11 October 1864.

1. It is desirable that this letter, in which Mr. McIvor has thought fit to make remarks with reference to the course taken by me, in bringing to the notice of Government what I conceive to have been his disregard of the orders prohibiting the felling of the forest on the western side of the hill above the Pykara waterfall, should be accompanied by observations from me on one or two points.

2. In the 6th paragraph Mr. McIvor states, on what authority I am not aware, that I have "frequently asserted that the Chinchonas would be the ruin of the Neilgherries, by causing the felling of the natural forests." Any remarks I have made on this subject have been made in the freedom of private conversation; and they were certainly not open to the construction which Mr. McIvor has put upon them, and which implies that I am opposed to the cultivation of the Chinchona. This is altogether a mistake. No one is more sensible than I am of the importance of the work on which Mr. McIvor is engaged, and no one has been more ready to acknowledge the skill with which Mr. McIvor has conducted it. What I have said is, that if Mr. McIvor was not kept in check, serious mischief would be done by the indiscriminate felling of the hill forests, the more especially as Mr. McIvor has recently propounded, what I conceive to be a most mischievous theory, that felling the forests tends to increase the water supply. I have always considered it a matter of regret, that the site of the Pykara waterfalls, which is the most beautiful spot within easy reach of Ootacamund, should have been selected for a plantation; and I hold, and have expressed a very strong opinion as to the impropriety of Mr. McIvor's conduct in setting at nought the orders of Government, which prohibited the felling of the forest on the western side of the hill so completely as he has done.

3. The other assertion which I think it right to notice, is that in paragraph 7, where Mr. McIvor states, that in January last I was aware of the opening out of the avenue and road. This is not the case; I heard nothing of it until March or April, and it was not until I visited the spot in July, that I had any conception of the extent of the mischief.

(signed) *A. J. Arbuthnot*,
Chief Secretary.

Enclosure 11, in No. 33.

MINUTE by the Honourable *E. Maltby*.

1. I AM a stranger to the locality in question, but assented to the order of which Mr. McIvor complains, because it appeared to me that an express order of the Government, passed with the President's concurrence, had been disregarded, and that this must be noticed unless all control over Mr. McIvor's proceedings was to be abandoned. The tone of Mr. McIvor's present letter supports the view I took of the necessity of noticing his conduct, and is, in my opinion, highly censurable. I cannot suppose that Mr. McIvor would have ventured to write in such a style, unless he looks on his services as too necessary to Government to be dispensed with, or his circumstances render him independent of public employ. Had there been really any decision to make between Chinchona plantations and pleasing scenery, I should have considered the former as of too paramount importance to be sacrificed to the latter, but it cannot be said that this has been the case. The Neilgherry plateau affords abundant sites for plantations at different degrees of elevation, and Mr. McIvor has been allowed a free selection. On his wishing to try a plantation at Pykara, a suitable piece of ground was given him, under the sole restriction that the forest on the side of one hill was not to be interfered with. This restriction did not impede the formation of the plantation, and was imposed to preserve the scenery of a favourite place of resort.

2. What Mr. McIvor writes about restrictions which "greatly discourage" him, and about "a covert feeling of class prejudice" against Chinchona cultivation, is as simply preposterous as it is unbecoming. Private plantings have been numerous, and the Government records amply show that the success which has attended the experiment is as much owing to the support which Mr. McIvor has received as to his own professional skill. This skill the Government has both acknowledged and rewarded, but it is impossible for Government to permit one of its servants to address it in the manner which Mr. McIvor has now done.

3. I consider that Mr. McIvor should be informed that his resignation will be accepted unless he recalls this letter and engages to comply with the instructions which Government may from time to time issue; that his threat of retiring from "this important undertaking" on so trivial a ground, at what he describes as "the present interesting and in some respects still critical period of operation" is viewed with disapprobation, and that

any "gratuity, pension, or award" on account of past services, which he may look for from the benevolence and liberality of Government, will be affected by the conduct which he pursues on this occasion.

4. If Mr. McIvor persists in his intention of resigning, he should be required to state whether he is prepared to continue in charge of the department until a successor arrives from England. Should he decline to do so, the Government can, I doubt not, make due arrangements for the temporary care of the plantations and nurseries, and Mr. McIvor will, in my opinion, have forfeited any claim to the liberality of Government by thus abruptly quitting its service.

5. Even if Mr. McIvor continues in the public service, it seems to me essential that steps should be taken to obtain from England an assistant or deputy competent to take his place in case of need. The value of the Chinchona plantations is already great, and increases yearly, and steps should be taken to guard against the effects of the superintendent's possible illness or death. Government should also be relieved from its present comparatively helpless position, and be able to act promptly if Mr. McIvor should again presume to conduct himself as in the present instance.

6. In assenting to the removal of the Chinchonas from the avenue planted by Mr. McIvor on the forbidden hill to the adjacent plantation, I was not actuated by any idea that the line of trees would spoil the forest scenery, but by a desire to show Mr. McIvor that the instructions of Government must be obeyed. My impression was that the Chinchona plants might be 100 or at most 200 in number, but under the information now given in Captain Beddome's letter of 15th instant (circulated with these papers), I consider that these trees should remain, and that other Chinchonas and some Australian trees should be planted to fill up the gap. I am prepared to assent to Captain Peddome's suggestion that the avenue should be placed under the Chinchona superintendent, due precaution being taken against further felling of the forest.

22d October 1864.

(signed) *E. Maltby.*

Enclosure No. 12 in No. 33.

MINUTE by Sir *William Denison.*

1. I have seen, for the first time, the proceedings of Government of 28th September 1864, and have now to deal with matters arising out of these proceedings. Had these been forwarded to me previous to publication a good deal of trouble and difficulty would have been spared, and I should not have been compelled to bring the subject again under the consideration of the Government.

2. There are two matters involved in the papers before me: first, the proceedings of the Government above alluded to; second, the letter from Mr. McIvor arising out of these proceedings. I will deal with the two in the order above stated. In order, however, to bring the matter in all its bearings clearly before the Government, I must enter into some little preliminary detail. When the Government commenced the experiment of cultivating Chinchona, it entrusted the general arrangement of the plantations entirely to Mr. McIvor. He laid out the land, cleared it, made all the roads, &c., and the Government has not, except in the present instance, had any reason to complain that the confidence placed in that officer has been abused.

3. Even in the present instance I do not think that I should be justified in saying that confidence had been abused.

4. Mr. McIvor was permitted to commence a plantation in the immediate vicinity of the Pykara Falls. The Government did not ask for any plan of the ground, or for any description of the mode of access to the plantation; it gave Mr. McIvor, by implication, at all events, the same latitude, and the same discretion, which it had heretofore done, and he accordingly acted according to his judgment and taste. After a time, however, the Government was informed that the ground by the side of the river was being denuded of timber; upon this, after some correspondence with the collector, an order was issued to the following effect: "The Government are glad to find that the plantation will not affect the scenery about the Pykara Falls, within sight of which felling will not be allowed." No plans, however, were asked for; no inquiry made as to the extent of the plantation; the mode of getting access to it, &c., all was left to the discretion of Mr. McIvor. On 8th August the chief secretary, having visited the Pykara Water Falls, pointed out to the Government that Mr. McIvor had cut a large gap in the wood, in direct disobedience to the orders from Government: upon which he was called upon for an immediate explanation of his conduct. This Mr. McIvor did by quoting a letter written by me, in answer to a description given by him of the mode in which he proposed to complete the communication to the plantation, in which I gave a general approval of the scheme; and he explained that he did not consider the order of government forbade opening a road through the wood, without which the plantation could not have been worked.

5. This paper was sent to me, and I pointed out that Mr. McIvor was not justified in interpreting the assent given by me to a proposal stated by him, unaccompanied by any plan or sketch, as an order to him. I gave some opinion as to the character of the road which he had made, having visited the plantation in the interval, and I stated that I could
not

not approve of a suggestion of Mr. Pycroft, that the Chinchonas should be removed, or that an attempt, which must prove unsuccessful, should be made to restore the forest to its original state.

6. On the 28th September 1864 an order was given to the effect that the injury to the forest could not be repaired by planting Australian, or other trees, but had better be left to nature; that the Chinchonas should be removed to the plantation; that the western side of the hill should be handed over to the conservator of forests, who would leave a sufficient breadth of pathway for the labourers, and restricting Mr. McIvor to the use of the path for himself and his labourers. Had this order been sent to me before publication, I should have pointed out that the damage having been done, and the expense of clearing the forest and planting the Chinchonas incurred, it would be very bad policy, on the part of the Government, to go to the further expense of removing the plants, and re-planting them elsewhere, at the risk of the loss of a good number; that to leave the restoration of the forest in nature's hands would be, as stated by the conservator of forests, to create a mere dense, thorny jungle, which would not harmonize in any way with the forest on each side of it. That, as also suggested by the conservator, Mr. McIvor, might as well be allowed to fill the cleared land with Chinchona, a fast growing and very handsome tree.

7. I may as well state that I do not consider the beauty of the falls to be so irreparably injured as is inferred by some. Neither indeed do I agree with those who seem to think that every sacrifice should be made by the Government for the purpose of maintaining the landscape in its original form. I should not have sanctioned the cutting down of the forest had I seen a plan of the work intended previous to its commencement; but I think that a great deal more has been made of the damage to the scenery than is necessary.

8. Looking, then, to the fact that the conservator of forests is of opinion that the presence of about 25 acres of kumiry jungle will not add to the appearance of the scenery; that the Government has incurred the cost of clearing the ground, which would be lost if it were allowed to return to forest; that the Chinchona is said to be a handsome tree, and that at all events it is a profitable one; that the land in question will contain 20,000 trees, and be worth in the course of a few years at least 1,500 *l.* or 2,000 *l.* per acre, I propose that the Order of the Government of 28th September should be reconsidered, and that the land cleared should be planted with Chinchona, and left in the hands of the director of the Chinchona plantations.

9. I do not propose to exonerate Mr. McIvor from blame. Indeed, I should be disposed to have dealt with his conduct more directly, but as the opinion of the Government has already been communicated to him, I shall deal only with his letter in reply.

10. I strongly object to the tone of this letter, and am of opinion that Mr. McIvor should be told that the Government is not to be addressed in such a tone or manner by its subordinates, whose business it is to obey instructions issued to them; or, if they conceive their instructions likely to be injurious to the interests of Government, to submit their views in a proper manner for consideration.

11. With reference to Mr. McIvor's tender of his resignation, he should be informed, of course, that he is under no obligation to remain in the service of the Government; but that he has no shadow of a claim to either pension or gratuity should he choose to resign his appointment merely on the ground that he has been reprimanded for disobedience of orders.

12. Some inconvenience has evidently arisen from the amount left to the discretion of Mr. McIvor. It would be worthy of consideration whether he should not for the future be called upon to submit rough sketches of the mode in which he proposes to lay out the plantation. It may also be a matter worthy of consideration whether he should not be provided with an assistant or deputy, at a salary of, say, 300 rupees per month. At present there is no one between Mr. McIvor and the superintendents of gardeners in charge of the different plantations.

26 October 1864.

(signed) *W. T. Denison.*

Enclosure 13, in No. 33.

MINUTE by the Honourable *T. Pycroft.*

1. THERE seem to me to be two matters for consideration in connection with Mr. McIvor's late proceedings on the western side of the Pykara Falls, and with his recent letter. First, how the tract denuded by Mr. McIvor should be dealt with; and, secondly, the tone of his recent letter, and the position which he has therein assumed towards the Government.

2. As to the first, unhappily, we have but a choice of difficulties. The original forest has been laid low, and cannot be replaced in its pristine state. We must either leave the clearing to nature, in which case, as would appear from the conservator's letter, it would become overgrown with dense thorny jungle, or have it planted with Chinchona and perhaps some other trees. I do not know that the latter course is preferable to the former. The Chinchona may be a handsome tree in its native forests, and standing singly or in clumps, but planted in stiff formal lines, as it is in the Government plantations, and as it

was by Mr. McIvor on the sides of the gap which he cut in the forest, it certainly has not an ornamental appearance. However, as his Excellency the President and Mr. Maltby seem in favour of the latter mode of proceeding, I do not object. I am certainly reluctant that Mr. McIvor should have anything more to do with the tract after the way in which he has behaved; and under any circumstances, before he is allowed to meddle with it, we should know exactly how he proposes to proceed; he should work only on the plan that we may sanction, and measures should be taken for preventing any further felling on that side of the river under any pretext whatsoever.

3. With regard to the tone of Mr. McIvor's letter of the 11th ultimo, and the attitude which he has assumed in it, I entirely agree with my colleagues. A more arrogant and disrespectful document I do not remember to have seen. I would particularly draw attention to the concluding paragraph, in which he insinuates that the late orders of Government, to which he gives a meaning which he must well know they could not and were not meant to bear, were made purposely stringent so as to entrap him into disobeying them, and actually makes this the ground of his desire for retiring from the charge of the plantations. If a public servant, because his proceedings are not approved and are to some extent ordered to be reversed, is to write in this manner, there must be an end of all subordination. I would tell Mr. McIvor that the Government strongly censure the objectionable style of his last letter; that if he chooses to retire from the charge of the Chinchona plantations he may do so, but that pensions or gratuities are not bestowed on men who throw up their appointments because they cannot have their own way, and quarrel with the orders of the paramount authority. I would warn him further that if he again addressed Government in such a tone they would at once remove him from his post. This might cause some inconvenience, but would be preferable to tolerating such language from Mr. McIvor. Moreover, I do not deem his services quite so indispensable as he evidently considers them. I do not doubt that the Forest Department, with the aid of the subordinate servants in the Chinchona plantations, would keep matters going fairly enough until a skilled gardener and arboriculturist could be procured from England.

4. Reprehensible as is the style of Mr. McIvor's letter throughout, that part of it is most especially censurable in which he has made a most wanton and groundless personal attack upon the Chief Secretary, charging him with exaggerated representations made from narrow-minded motives, and indeed accusing him of disingenuous conduct in the matter. Mr. Arbuthnot's memorandum contains full explanation on both these charges. In noticing the objectionable nature of Mr. McIvor's letter, the Government should, I conceive, mark with their peculiar displeasure that part of it which contains these injurious and unfounded imputations on their chief officer.

5. During my late visit to the Neilgherries I had not an opportunity of going to the Pykara Falls. Had I foreseen the turn which this discussion has taken, I would have made a point of visiting them. I may, however, mention that more than one gentleman with whom I conversed on the subject, and whose names, were it necessary for me to give them, would be deemed a sufficient guarantee, told me that Mr. Arbuthnot's description was by no means overcharged. It will be observed that the officiating conservator of forests, in his letter, of 15th October, speaks of the extent of clearing as being very large.

6. I concur with my colleagues that it is desirable to apply to the Secretary of State for an assistant to the Chinchona superintendent of a higher order than his present subordinates, one who could take his place in the event of his death, absence from sickness, or of his relinquishment of or removal from his appointment under what we must now consider a not impossible contingency. At present there is reason to believe that, as observed by Mr. Maltby, Mr. McIvor is either independent of Government employ from private sources, or considers that he is too valuable to be spared, and is therefore emboldened to act as he has done. I would not, as I have already noticed, hesitate to undeceive him in this last view, if necessary. Still the presence on the spot of an assistant in all respects qualified to perform his duties would be a check on him and strengthen the hands of Government.

7. As Mr. McIvor maintains in his letter that in making the clearing on the west side of the falls he did not violate any express order of Government, I annex an abstract of the correspondence which took place on the subject in 1863.

On the 2d January 1863 Lieutenant Colonel Hamilton brought to the notice of Government that the site recently selected for Chinchona operations in the Pykara Valley was in the hanging wood over the falls of the river. He objected to this as mainly affecting one of the most picturesque and beautiful spots on the Neilgherries; mentioned that a large portion of the same Shola at the back of the hill on the eastern slope seemed equally well adapted for the purpose, and suggested that the whole of the forest within sight of the falls might be preserved intact.

The Government G. O., 6th January 1863, desired the collector to inspect the locality in company with Mr. McIvor, and to select a site for the plantation sufficiently remote from the river not to interfere with the scenery about the falls.

Mr. McIvor, on the 7th January 1863, in reference to a telegram ordering him to suspend felling near the Pykara Falls, said that not a tree had been felled near the falls since the previous November, and then only one acre for a nursery. This spot had been selected because it was considerably removed from the forest which was intended to be felled for the Chinchona plantations, and the plants would not be damaged by the fire whilst the forest was being burnt. It was never intended to fell another tree on the waterfall face of the

the hills. The forest on the waterfall side faced west and south, being an exposure unsuited for the growth of Chinchona.

In his letter of 15th January 1863, Mr. Grant reported that the plantation would not be within the sight of the falls, but on the eastern slope of the hill, the locality in fact pointed out by Colonel Hamilton as best suited for the purpose. No further felling was contemplated when the nursery had been formed.

The Government (G. O. 23d January 1863), expressed their satisfaction that the plantation would not affect the scenery about the Pykara Falls, within sight of which felling would not be allowed.

Unless these papers be understood as assuring the Government that the Chinchona planting operations would be confined to the eastern slope of the hills, and that Mr. McIvor understood them in that sense, and promised to act up to them, it is difficult to say what meaning is to be extracted from them.

Again, if cutting a gap at least 40 yards wide, on the western side of the hill, where Mr. McIvor had assured Government that "it never was intended to fell another tree," and that "the exposure was unsuited to the growth of Chinchona," was not an infraction of the Government orders, it is hard to tell what disobedience of orders is.

4 November 1864.

(signed) *T. Pycroft.*

Enclosure 14, in No. 33.

From *W. G. McIvor, Esq.*, Superintendent Government Chinchona Plantations, to *J. D. Sim, Esq.*, Secretary to Government, Revenue Department, Fort Saint George.

Sir,

Ootacamund, 3 November 1864.

1. WITH reference to the Order of Government, 28th September 1864, No. 1794, and my letter of the 11th ultimo, No. 155, I have the honour most respectfully to bring to the notice of Government, that as an unusually severe drought has set in, and the plants upon the upper portion of the Wood plantation near Pykara are already suffering severely from want of water, and if the drought continues for a fortnight more the greater portion of them will be dead, unless immediate steps are taken to turn the water course at a higher level, in order to admit of irrigation. I would, therefore, solicit the favour of being advised by telegraph as to what steps I am to adopt in reference to this matter.

2. Further supplies of grain are also necessary for the establishment on the plantation; this I have delayed getting in as long as possible, as the loaded bullocks and men in charge of them would certainly cause an infringement of paragraph 3 of the Government Order above noted; I would, therefore, esteem it a favour my being instructed as to how to proceed in this respect.

3. I would also observe, that although I explained the orders of Government to my establishment with as much leniency as possible, since doing so I have lost one maistry with 43 of my best trained men; and I much fear that if immediate steps are not taken to remove these restrictions, at least so far as they affect my establishment, we will shortly not have a man upon the plantation; and, as the dry weather is now setting in, this would prove its total destruction.

4. I have been most unwilling to trouble the Government on this subject, and have delayed doing so in daily expectation of our usual rains, but as there is still no appearance of these, it becomes imperative that I should bring these facts to their notice.

Enclosure 15, in No. 33.

ORDER of the Madras Government, 8 November 1864.

1. IN his letter above recorded the Superintendent of Chinchona plantations submits a further explanation of his conduct in cutting an avenue through the forest in the immediate neighbourhood of the Pykara Falls.

2. As Mr. McIvor maintains that this act was not an infringement of their orders, the Government will briefly notice the correspondence on the subject.

3. On the 2d January 1863, Colonel Hamilton brought to notice, that the site selected for Chinchona operations in the valley of the Pykara river would "materially affect one of the most picturesque and beautiful spots on the Neilgherries, the hanging woods over the falls of the river being doomed to destruction, thereby utterly depriving the scene of its chief ornament." At the same time he mentioned that a large portion of the same shola, at the back of the hill on the eastern slope, seemed equally adapted for Chinchona cultivation, and suggested that the whole of the forest within sight of the falls, should, if possible, be preserved intact.

4. Mr. McIvor was directed, by telegraph, to stop felling the wood until further orders, and the collector was instructed to visit the locality with him, and "select a site for the plantation sufficiently remote from the river not to interfere with the scenery about the falls."

5. Mr. McIvor immediately replied to the telegram, and stated, that "not a tree had been felled near the Pykara Falls since November, and then only a space of one acre for a nursery;" that "it never was intended to fell another tree on the waterfall face of the hills," and that the plantation was "not within sight of the waterfalls, being on the opposite face of the hills, viz., north and east, while the forest on the waterfall sides faces west and south, being an exposure unsuited for the growth of Chinchona; and, consequently, it never was intended to fell this forest for a Chinchona plantation."

6. The collector's report was much to the same effect, and the Government Order was in the following terms:—"The Government are glad to find that the plantation will not affect the scenery about the Pykara Falls, within sight of which felling will not be allowed." These papers can be regarded in no other light than as evincing the desire of Government that the forest on the western sides of the hill should be preserved in its natural beauty, and as conveying an assurance from Mr. McIvor that this wish should be scrupulously respected. Yet it is through these very woods that Mr. McIvor has cut an avenue at least 40 yards wide.

7. Mr. McIvor argues, that in paragraph 3 of his letter of the 7th January 1863, he signified his intention to form roads to the plantation, passing the waterfalls, and that as Government did not notice this matter, he concluded that they approved of it. Mr. McIvor, in the letter referred to, certainly did mention the intended formation of roads, but not in such a manner as to lead Government to suppose that they were to pass through the very Shola in which, in the same letter, he stated "it never was intended to fell another tree." His expression was "the roads formed for the plantations will render the falls easily accessible." But, independent of this, it must be observed that even had the allusion to roads been more definite, the Government would never have supposed that Mr. McIvor meant cuttings of the width of 120 feet. They would naturally have imagined that roads of 12 or 15 feet in width were all that Mr. McIvor contemplated.

8. In paragraphs 6 and 10 of his letter of the 11th ultimo, Mr. McIvor alludes to the restrictions placed upon him in paragraph 3 of the Order of Government as unprecedented and of ruinous tendency. The paragraph limited Mr. McIvor "to the use of the path for himself and his labourers," and the evident intention of the order was simply to restrain him from further felling and other interference with the forest or road. Mr. McIvor's idea that he is expected to forbid his labourers "to diverge from the path to obtain water, collect firewood, and other innocent purposes," is simply absurd.

9. The Government learn that the Forest Department cannot conveniently take charge of the avenue, and that as the trees have been burnt, others are not likely to spring up, if the opening be left to nature. Under these circumstances the Government resolve to cancel so much of their Order of the 28th September last, as transfers the avenue to the Forest Department. Mr. McIvor will accordingly resume charge of it, and will complete the formation of the road and keep it in repair, but he is distinctly to understand that not another tree is to be felled on any account. As Mr. McIvor assures the Government that Chinchonas will harmonize with the rest of the forest, he may plant these in the opening, but it would be well to do this in a less formal manner than as an avenue. This, as well as the introduction of other suitable trees is, however, left to his judgment.

10. The only point remaining to be noticed is the tone of Mr. McIvor's letter, and the position he therein assumes towards the Government.

11. The Government are well aware of the valuable services which Mr. McIvor has rendered the State in connection with the introduction of the Chinchona; they have repeatedly expressed their appreciation of his exertions, and they attribute the success of the experiment mainly to his skill. From first to last they have reposed entire confidence in him, and afforded him the fullest support. It is with much regret, therefore, that the Government feel compelled to record their serious dissatisfaction with the tone and tenor of the letter under consideration. A more improper letter in every sense could scarcely be addressed by a subordinate to his Government. Not content with bringing against the Chief Secretary unfounded charges of making exaggerated representations and being actuated by unworthy motives, Mr. McIvor accuses the Government of imposing on him restrictions, the severity of which is incomprehensible unless designed "to render their violation inevitable," and so subject him at any moment to dismissal "on a plea of disobedience of orders," or in other words, that this part of the Order of Government is simply a device to entrap him. Throughout the letter in fact Mr. McIvor assumes an attitude towards the Government wholly subversive of all subordination.

12. The Government cannot permit their subordinates to address them in this reprehensible manner, or thus to ignore their authority.

13. Mr. McIvor is under no obligation to continue in the service of Government, but officers who suddenly resign their appointments, endangering the interests entrusted to them, because they cannot have their own way in any particular matter, forfeit all claim to pension or gratuity.

14. Mr. McIvor will now be called upon to reconsider his letter of 11th ultimo, and to inform the Government whether he adheres to his wish to be relieved, and if so, from what date.

15. With regard to Mr. McIvor's second letter, the Government observe that their Order of the 2nd September last makes no allusion to watercourses at all. These involve no felling of the forest, and Mr. McIvor is quite at liberty to divert them when necessary as well as keep them in repair. As regards the use of the road, it has already been pointed out that the Order of Government was not intended to bear, and in fact does not bear

bear the construction put upon it by Mr. McIvor, the loss of labourers is consequently entirely due to his mis-interpretation of the order.

Ordered that the following telegram be despatched to Mr. McIvor:—

TELEGRAM.

“Your letter of 3d instant, No. 172. You may alter the watercourses and use the road freely, but there must be no more felling. The road and avenue, on this understanding, are replaced in your charge.”

Enclosure 16, in No. 33.

From Captain *R. H. Beddome*, Officiating Conservator of Forests, to *J. D. Sim*, Esq., Secretary to Government, Revenue Department, Fort St. George.

Sir,

Ootacamund, 15 October 1864.

I HAVE the honour to inform you that I have inspected the portion of the shola felled by Mr. McIvor near the Pykara Waterfalls, and alluded to in the General Order, No. 1794, of the 28th of September. As the shola has been burnt it will not now renew itself, but a dense thorny jungle (styled Kumri jungle) will rapidly spring up. Under these circumstances I would suggest that Mr. McIvor should now be allowed to plant it with chinchona, which is a fast growing and very handsome tree, or to avoid the sameness that a large mass of one particular sort of foliage would give to the scenery, a selection of various Australian acacias and eucalypti might be planted in connection with it, and perhaps a few of the easier growing jungle trees; the shola remaining under Mr. McIvor (who has an establishment on the spot) until the growth of the trees is fairly established. If the shola was now to be placed under the Forest Department we must send out an establishment and probably an overseer, and hut them, and any attempt to plant only jungle trees, would I am afraid, be a failure, their growth is so very slow and uncertain, and as the clearing alluded to is very large they would probably die from exposure.

ORDER of the Madras Government, 14 November 1864.

THE road and avenue will be replaced under Mr. McIvor, but it must be distinctly understood that no further felling will on any account be allowed.

Enclosure 17, in No. 33.

From *W. G. McIvor*, Esq., Superintendent, Government Chinchona Plantation, to *J. D. Sim*, Esq., Secretary to Government, Revenue Department, Fort St. George.

Sir,

Ootacamund, 9 January 1865.

1. I HAVE the honour to acknowledge the receipt of the Order of Government, under date 8th November 1864, No. 2058A, and with reference to paragraphs 11 and 12, beg to express my regret for any expression in my letter of the 11th October last, which may be considered insubordinate, and solicit the favour of being permitted to withdraw the same, and beg most respectfully to explain that in writing the letter above noted I had not the most remote intention of offering any insubordination, or placing myself in opposition to the Government authority, although at that time I felt I had been injured, and that representations had been made to Government, calculated to impede the development of this important undertaking, and to this impression only is to be attributed the tenour of my letter.

2. The Order of Government under reply effectually removes all misconception of their Order of 28th September last, tending to impede the progress of the Chinchona operations, and is thus highly gratifying to my feelings, although I am still unable to see the justice of Government ruling that I disobeyed their orders in felling the avenue in question. I am aware that I deviated from the plans proposed in my letter of the 7th January 1863, in as far as I converted the road into an avenue, but, at that time, I had not the experience of a wet season, and the consequent annoyance to our establishment from the leeches, which necessitated this alteration in my plans, in order to get rid of them; but this deviation, I respectfully submit, was no infringement of the Government Order, inasmuch as it did not interfere with the fringe on the banks of the river, or cause felling within sight of the Falls; had it done this, I would have submitted the deviation for the sanction of Government, as personally it was immaterial to me whether the avenue was formed or not.

3. I would respectfully bring to the notice of Government that, in carrying out an undertaking of this kind, when constant variations are necessary to meet circumstances and seasons, it may be shewn that any given Order of Government had been violated in the letter, although strictly carried out according to the spirit and intention; as an example,

the Government in their Order under reply sanction the alteration of the water-courses as may be necessary for the benefit of the plantation, stating at the same time that "not another tree is to be felled on any account;" yet the bringing of the water-courses necessarily involves the removal of the few trees that come directly in the way, and as the felling of these cannot be seen, or be productive of any injury, I would submit that the Order of Government sanctions the removal of trees to this extent only, this being subordinate to the benefit to be obtained from the water.

4. The avenue is being repitted and prepared for planting during the spring, and I feel confident that the Government need not be under any apprehension as to the scenery about the falls being in any way permanently injured, for although this may be a matter of opinion at the present moment, in two years hence, when our plants are grown up, the improvement will be such as will not admit of a difference of opinion.

5. With reference to paragraph 14, in which I am called upon to re-consider my letter, I have the honour to withdraw my resignation, as it would have been with the deepest regret that I detached myself from this interesting undertaking, in which I have laboured with all the zeal and ability I possess; as, in fact, it is the height of my ambition to bring it to a most successful issue, and especially as I distinctly see the means of attaining this, for not only can the plants be made to grow luxuriantly, but I am convinced that by a judicious system of cultivation, it is quite possible to increase the average per-centage yield of alkaloids in our Neilgherry barks by at least four or five time the average product of South American barks.

Enclosure 18, in No. 33.

ORDER of the Madras Government, 16 January 1865.

THE Government accept Mr. McIvor's apology, and withdrawal of his letter and resignation.

— No. 34. —

From Sir *Charles Wood* to the Government of Madras.

India Office, London, 15 April 1865.

Para 1. I HAVE considered in Council your letters in the Revenue Department, noted in the margin,* reporting the progress of Chinchona cultivation on the Neilgherry Hills; and I am glad to find that the number of plants is steadily increasing, that their rate of growth is satisfactory, and that there is still a considerable demand for young plants among owners of land in the Hill districts.

* No. 19 of 1864, dated	23 July.	
31	"	* 25 August.
33	"	" 13 September.
37	"	" 19 October.
43	"	" 25 November.
45	"	" 22 December.
1 of 1865	"	" 11 January.
3	"	" 23 January.

2. In your Despatch, dated 11th January (No. 1), of 1865, you forward correspondence on the subject of a road which had been formed by Mr. McIvor, near the Pycara Falls. Your Excellency's minute fully explains the nature of the misunderstanding which appears to have arisen, and I therefore regret that the Order dated 28th September 1864 was issued.

3. This order has since been cancelled, and you have approved of the construction of a road to the plantation near the falls. I concur in the propriety of the censure which you have passed on Mr. McIvor's letter, dated the 11th of October. The tone of this letter was not becoming from a person in his situation; but I am very glad that the services of a public servant who has done such useful work, in an undertaking of much national importance, have been retained.

4. Your proposal to appoint a deputy superintendent under Mr. McIvor, with a salary of 360 L. a year, will receive further consideration; but, as at present advised, I am unable to see the necessity of such an appointment; while, in many respects, it would certainly be inconvenient.

5. In paragraph 3 of my Despatch, dated 16th January (No. 2), 1863, I desired that measures might be taken for obtaining an analysis of Chinchona leaves, and that a supply might be sent to some one of the Government hospitals.

tals for trial. I shall be glad to learn what steps have been taken for obtaining information as to the efficacy of these leaves in cases of fever.

6. The monthly reports on the Chinchona plants have been regularly received at this office; but it is some time since the annual reports on the Chinchona plantations, which should be submitted by Mr. McIvor, have come to hand. I desire that Mr. McIvor's annual report for 1864 may be transmitted to this Office, and be made public in India for general information.

7. I shall shortly have occasion to address you on the subject of your Despatch dated 12th August (No. 80) 1863, in which a suggestion is made that a Government manufactory of quinine should eventually be established at Ootacamund.

— No. 35. —

From Sir *Charles Wood* to the Government of Madras.

28 February 1865.

1. I HEREWITH transmit 25 copies of a pamphlet on the cultivation of quinine in Java and British India, by Dr. de Vry, which has been translated from the Dutch. Dr. de Vry was officially connected with the Chinchona plantations in Java for several years, and he has since visited the Neilgherry Hills. His remarks on the comparative merits of the methods of Chinchona cultivation, adopted respectively on the Neilgherry Hills and in Java are, therefore, of great value.

2. Copies of the pamphlet should be supplied to Mr. McIvor, and to others who may be interested in the cultivation of Chinchona plants in your Presidency

— No. 36. —

CULTIVATION of QUININE in *Java* and *British India*, by Dr. *J. E. de Vry*, late Superintendent of Chemical Researches in Netherlands India.

NOTICE.

DR. DE VRÏ, the author of the following pamphlet on "The Cultivation of Quinine in Java and British India," was connected with the Chinchona plantations in Java for several years, as inspector or commissioned to conduct the chemical researches. He afterwards visited the Neilgherry Hills; and his testimony to the superiority of the method of Chinchona cultivation adopted by Mr. McIvor over that which was pursued by Dr. Junghuhn in Java is of the highest importance. Dr. de Vry has also made a very satisfactory analysis of Chinchona bark grown on the Neilgherry Hills.

Dr. Junghuhn, the talented and energetic superintendent of Chinchona plantations in Java, died in 1864.

Clements R. Markham.

London, February 1865.

ON THE CULTIVATION OF QUININE IN JAVA AND BRITISH INDIA.

MUCH has been already written with regard to the cultivation of quinine in Java. I do not now pretend to treat the subject in any novel point of view, but simply, and in a popular form, to make an enlightened public more generally acquainted with the mode of cultivating quinine, and in so doing I shall, as far as possible, avoid everything of a personal nature which may be deemed derogatory to a subject of such general interest.

The original nursery of the trees which produce so indispensable a medicine for the protection of the lives of Europeans residing in the tropics, is the tropical portion of South America, where, at various heights above the level of the sea,

they grow in the primitive forests of the contiguous republics of Venezuela, New Granada, the Equator, Peru, and Bolivia. It appears that the medicinal properties of the bark of these trees have from time immemorial been known to the natives of those countries, but it was not before the year 1632 that its curative powers were recognised in Europe, and then only in a limited sphere. Subsequently, however, and more especially after the Countess de Chinchon, the wife of the Viceroy of Peru, had been cured of fever by making use of quinine, the bark in question became duly appreciated in a much wider circle.

The species of plants to which the quinine trees appertain was called by Linæus the Chinchona, in honour of the above-named lady. The barks, which subsequently to the discovery of their medicinal qualities were introduced into Europe, and which are derived from various species of the above-mentioned genus of plants, were soon contra-distinguished one from the other, so far as their curative effects, and consequently their intrinsic value, were concerned. Such was more particularly the case in 1820, when the proper anti-febrile components of the quinine barks were analysed by Messrs. Pelletier and Caventou, who gave those components the names respectively of quinine and chinchonine. On examining, however, a certain quantity of those two components, which M. Pelletier had prepared with his own hands and sent to me, I found that they were not perfectly pure, as they presented traces of two other substances now known as quinidine and chinchonidine.

In consequence of the noble discovery of Pelletier and Caventou, we now know that the febrifugal power of the quinine bark arises from four substances, the so-called quinine alkaloids, which greatly resemble one another, and which are called quinine, chinchonine, quinidine, and chinchonidine. Of these four the quinine is by far the most powerful, and that is the reason this alkaloid has, since its discovery, been almost exclusively employed by medical men in cases of fever. This is to be regretted in a certain point of view, for although it would be unpardonable to replace in serious cases of illness the powerful quinine by a less potent substance, it is certainly a pity that the latter should be almost wholly unappreciated and unemployed, thereby unnecessarily raising the price of quinine. It is a fact that there is no particular quinine bark yielding exclusively quinine, for even the species which is the richest in that alkaloid always contains a certain quantity of one or more of the three other constituents. In fact it happens that there are many barks which are wholly devoid of quinine, but which contain chinchonine, quinidine, or chinchonidine. The too exclusive use of quinine as a curative has for result that the chinchonine, and other alkaloids, obtained from the quinine barks, simultaneously with the quinine, in preparing it for manufacture, are almost unsaleable, so that the price of the raw material, and the cost of preparation, press entirely on the quinine, which is thus rendered unnecessarily dearer. This, however, should not be the case, inasmuch as the concomitant substances, such as chinchonine, &c., can be also used for dispelling fever. That those substances can be successfully employed has been proved by many skilful physicians, for example, by my friend Dr. Rombach, of Hellevoetsluis; and I myself, during nearly a six years' residence in Java, have always beneficially made use of quinidine for fever patients among my servants, without once being under the necessity of having recourse to the more expensive quinine. Although, for my own part, I am thoroughly convinced that all the above-mentioned for febrifugal components of the quinine barks may be advantageously employed, it is nevertheless certain that so long as that conviction does not become a general one, the quinine alone will have any real value, and, consequently, those barks which are the most productive of it will have the greatest commercial worth. Amongst the known barks, the Calisaya, which is indigenous to Bolivia, is the richest in quinine, and on that account it is the most in request for quinine manufacturers; the result is that the price of Calisaya quinine is becoming higher and higher every day, and it has therefore become necessary to employ other kinds of barks for obtaining a supply of quinine.

The constantly increasing use of quinine bark has given rise to the apprehension that the trees will gradually decrease in number in their original countries, and possibly become at last extinct. This fear was originated by the reckless manner in which the quinine trees in America were stripped of their bark in order to collect it in large quantities, and by the neglect in taking any steps to replace the felled trees by others. Extreme opinions are expressed with regard to this apprehension, but, as is generally the case, the truth lies in the mean.

mean. It appeared to me, after having made an express journey to London, that there was no ground for apprehending a scarcity of quinine bark in general, but only of such barks as contain quinine, so that I am convinced that the suggestion made years ago by Junghuhn, Royle, Blume, and others, namely, to introduce the quinine plant into the East Indies, is well deserving of being carried out.

The introduction of the quinine trees into the East Indies was at last effected under the government of our revered King William III., in the year 1852, when the first real quinine plant, and precisely the species which was the best adapted for quinine preparation, namely, the Calisaya, was brought to Batavia in the month of April on board the merchant ship "Prince Frederick of the Netherlands," Captain P. Huidekoper, and immediately afterwards set in the strawberry grounds of the Governor General at Tjibodas, on the slope of the Gedeh Mountain. The plant in question was obtained from Messrs. Thibaut and Keteleer, of Paris, who, through Professor de Vriese (acting under instructions from the Government), exchanged it for an assortment of Java plants. This plant died some time after, but not before Mr. Teijsmann, the superintendent of the plantation at Buitenzorg, had procured two slips from it, which slips by the year 1862 had grown up to trees 20 feet high.

Had it been known in 1852 with what facility and how quickly the quinine plant might have been multiplied by means of slips and "eyes"—and that facility was proved beyond a doubt by the skilful Mr. McIvor, the manager of the English quinine plantation at Ootacamund—the single Calisaya of Tjibodas would by this time have had millions of descendants, and thus the cultivation of the species, which has been found most suitable for quinine preparation, would have been placed on a permanently secure basis. Independently, however, of the want of experience in that year, it would have been too hazardous to rely on a single plant for the development of the newly introduced cultivation and thus the mission of Mr. Hasskarl to Peru was in every respect a desideratum. By his Majesty's Decree of the 30th of June 1852, the then Minister of the Colonies, Mr. Chas. F. Pahud, was authorised to engage Mr. Hasskarl to make a collection, of quinine plants and seeds, and the latter accordingly left Southampton for America on the 17th of December of that year; by the 28th of the following July he had forwarded to the Netherlands a good quantity of seeds, of various species of quinine trees, and those seeds were in part sent by the minister to Java, and partly distributed amongst the three academical gardens and the one at Amsterdam, in order to be carefully attended to.

The seeds which remained in the Netherlands soon shot up, but scarcely had the plants been further developed when the report spread that they did not belong to a good species of quinine trees. Abiding, however, by my resolution to avoid all personalities, I shall pass over in silence all that was said and written on that score, but I may be allowed to state that accidental circumstances afforded me the opportunity of hearing a competent authority declare that the greater portion of the seeds employed at Leyden had produced plants of the genuine Calisaya genus, and consequently the species most suitable for the preparation of quinine. In fact, I received a visit from the celebrated botanist, Dr. Weddell, so well known by his journeys through the quinine districts of South America, and at the request of the minister I accompanied the doctor to Leyden on the 24th September 1855, in order to show him the young quinine plants there, and to elicit his opinion respecting them. As soon as he saw them he declared that the greater number were of the true Calisaya quinine species, whilst he refrained from expressing any positive decision with regard to the remainder, as the species to which they belonged was not, he said, exactly known to him. Although the latter plants were labelled *Chinchona ovata*, it subsequently turned out that Dr. Weddell had acted wisely in not forming a positive opinion respecting them, inasmuch as, after undergoing many changes of name, they were at last described as a new species, and thenceforth called *Chinchona Pahudiana*. The quinine plants obtained in the Netherlands from the seeds in question were forwarded in various vessels to Java as opportunities presented themselves, amongst others a considerable number in September 1855, accompanied by Mr. Junghuhn himself.

The seeds which had been sent to Java in November 1853, were sown at Tjibodas by Mr. Teijsmann, with the assistance of the superintendent, Mr. Teuscher. Although I do not know the exact number of those seeds, it appears

by an official report that it must have been considerable, as they filled 11 beds 40 feet in length and 4 in breadth. Whether that mode of treating the seeds was an exactly advantageous one, or whether the seeds themselves during the voyage from Holland to Java had lost a portion of their sprouting power, I cannot take on myself to decide, but it is so far certain that the quantity of quinine plants which were obtained from them was very small, and out of all proportion with the number of seeds which had been sown.

Whilst this was occurring in Holland and in Java with respect to the seeds which Mr. Hasskarl had forwarded from Peru, he himself landed in Batavia on the 13th of December 1854, with 21 chests of quinine plants, and he was entrusted by the Government with the management of the quinine cultivation. In this post, however, he did not long continue, for having fallen ill he was obliged to ask leave of absence, and he returned to Europe in the second half of the year 1856. The late Mr. F. W. Junghuhn, the inspector, who had been commissioned to carry on investigations with respect to natural history in the Dutch Indies, was appointed by the Governor General to the vacant place, at first temporarily, but afterwards permanently.

It appears by official reports, published on the 20th of July 1856, that, on the arrival of Mr. F. W. Junghuhn, the number of living quinine plants in Java did not exceed 251, and although there were also some 1,650 slips in the ground, the majority had not taken root. Taking this fact in connection with the large quantity of seeds sown, and the 24 chests of live quinine plants brought by Mr. Hasskarl, one would certainly consider the result here given as unfavourable, and imbibe the impression that at the commencement there must have been many adverse circumstances militating against the young plants, although the nature of those obstacles is not, so far as I can see, clearly explained in the reports of that time. The 251 quinine plants in existence on the 20th July 1856, were distributed between the plantation at Tjibodas, on the Gedeh Mountain, and the Tjiniroean plantation on the Malabar. Those plants consisted of 99 *Chinchona Calisaya*, 140 *Chinchona Pahudiana*, 7 *Chinchona lanceolata*, 1 *Chinchona succirubra*, 3 *Chinchona lancifolia*, and 1 *Chinchona pubescens*.

Shortly after Mr. Junghuhn had thus undertaken the management of the quinine cultivation, it appeared to him that for the most part the plants at Tjibodas were in a pining condition, and in fact some of them died. These lamentable circumstances he attributed to two causes; first, to planting them in places where they were fully exposed to the sun without any shade whatever; and, secondly, to the unfavourable nature of the ground, composed of an impenetrable bed of *tjadas* (a Javanese word), scarcely covered by a thin layer of mould. With regard to the former cause, I am convinced, now that I have seen the quinine cultivation in the Neilgherries, that no importance need be attached to it, inasmuch as the quinine plants, when once they have well taken root, grow up at a suitable height above the level of the sea, although openly exposed to the sun's rays. The latter cause, however, is a well-founded one, as I myself became convinced after several quinine trees had decayed on the plantation at Tjibodas, and after they had been taken up in my presence; moreover, the spots where the trees stood were enclosed with palings, at my own charge and in my presence, in order that anyone, so disposed, might ascertain the real facts of the case with reference to this disputed point. In the interest of the history of the affair I have preserved some portions of the roots of the quinine trees which I had thus caused to be dug up, and every one can see by the volcanic nature of the mould still adhering in a dried state to those pieces, that the ground was unfit for the plants, which had pined away. As the site of the plantations at Tjibodas was so unfavourable, Mr. Junghuhn was induced to suggest to the Governor General the advisableness of transferring them to the neighbouring wood on the declivity of the Gedeh Mountains. This suggestion was approved of, and the transplanting was accordingly effected; but though this transplanting from the unsuitable site at Tjibodas was justified under all the circumstances, such was not, in my opinion, the case with regard to the transfer of the quinine trees from Tjiniroean to the Malabar plantation in the primitive wood on that mountain, as the Tjiniroean site was, as Mr. Junghuhn himself declared, a really excellent one. The reason for this transplanting was that Mr. Hasskarl, in laying down the plantation, had the forest trees removed and replaced by "dadap" trees (*Erythrina Indica*), which afforded a far less deep shade than the former ones. Mr. Junghuhn, in fact, started from the principle that, inasmuch as the quinine trees

trees in their primitive countries grew in thick woods, and consequently in deep shade, those trees which had been brought to Java should be placed in analogous situations, and on that principle he worked from the time he assumed the management of the quinine cultivation until the commencement of the year 1864. Whether such a basis of operations is the best for obtaining a speedy and large supply of quinine bark will be seen in the sequel, by comparing it with the method pursued by the English.

As it was of the highest importance to increase the small number of plants, Mr. Junghuhn established nurseries in Tjinerocan for the purpose of tending the slips. By these means the number of plants was certainly augmented, but not in the proportion they might have been if Mr. Junghuhn had also applied to that subject his remarkable attainments in natural history. The slips which had been destined for the propagation of the species were described by himself as "twigs cut close under the leaf-knob, which should not be of greater length than, as a maximum, half a foot," and he very justly remarks that such slips produced plants which could not withstand any baneful external influences. It is a pity that after so well-founded an observation he did not proceed to discover the cause of such a fact by making certain experiments, for had he but done so he would certainly have ascertained, as Mr. McIvor did, that his slips were too large, and that the increase of quinine plants can be, *par excellence*, effected by means of slips, provided the latter are taken as small as possible.

Thus, whilst Mr. Junghuhn, by neglecting to interrogate Nature in a proper manner, arrived at the conclusion that it would be more advisable to have recourse to seeds instead of plants for the purpose of increasing the number of quinine trees, Mr. McIvor, by dint of judicious experiments, formed quite a contrary opinion, consequently giving the preference to slips over seeds.

Although Mr. Junghuhn, for the reasons just stated, was not so successful as he might have been in the development of the quinine cultivation by means of slips, nevertheless the number of plants in Java was augmented by his exertions, and the result was that he was enabled to give a greater extension to his plantations; accordingly he successively established several on the Malabar mountain, and they are now officially registered under the names of the Pahud Plantation, the Gedong-badak Plantation, &c.

The development of the quinine cultivation in Java would have only slowly progressed had not some of the trees which had been planted at Tjibodas begun to blossom forth in the month of June 1857, thereby affording the prospect, so much desired by Mr. Junghuhn, of a welcome supply of seeds. It is true that the first flowers disappointed that hope, as they withered away, but soon afterwards other blossoms made their appearance, and finally, the first ripe seeds were obtained in June 1858.

The species which furnished those seeds was introduced into Java under the name of the *Chinchona ovata*, but it subsequently obtained the name of *Chinchona Condaminea*, the reason for such a change being that it is impossible, with respect to many kinds of quinine trees, to determine the exact species before the trees bear flowers and fruit. Thus, so soon as the doubtful Chinchona blossomed and yielded fruit, it furnished Mr. Junghuhn with the necessary data for forming an opinion on the subject, and after due examination he came to the conclusion that this particular Chinchona was either a *Lucumæfolia* species, or a new one.* In order to remove all doubt on the subject, I obtained the consent of the Governor General to send a flowering branch with fruit to my friend Mr. Howard, the quinologist, in London, who by his purchase of the herbarium of Ruiz and Pavon, was in the best position to settle the question; and that gentleman, after duly examining the specimen forwarded to him, declared that it was not the *Chinchona Caravayensis*, as was thought by some persons in Holland, but a hitherto unknown species, to which he gave the name of *Chinchona Pahudiana*.†

The species, since then known under the above name in the official registers

continued

* The cause of this doubt on the part of Mr. Junghuhn,—a doubt which has given rise to some unjust strictures—in this regard, may be attributed to the brevity of Dr. Weddell's description of the *C. lucumæfolia*; for example, it is not stated in that description whether its leaves are fibrous or not.

† According to Dr. Weddell, the *Chinchona Caravayensis* attains, in its native land, to no greater height than three metres (about nine feet), while a specimen of the *Chinchona Pahudiana* on the slope of Mount Gedeh was, at the end of the month of December 1863, 34 Paris feet in height (a Parisian foot = 13.124 English inches.) It is, therefore, of importance to note the difference in nomenclature, as the bark of the *Chinchona Caravayensis* does not possess any value.

continued from 1858 till 1863, when I last saw it, to furnish flowers and fruit, so that millions of seeds have been procured from it. It is true that some of the Calisaya trees in the plantation at Tjibodas also yielded flowers and fruit, but they died before all the seeds had arrived at maturity, in fact, Mr. Junghuhn obtained for available purposes millions of ripe seeds from the *Chinchona Pahudiana*, and only a thousand seeds from the *Chinchona Calisaya*.

Taking into consideration what I have already said with regard to the less successful results of re-production by planting slips, one will easily discover the reason why the increase of the Calisaya quinine bears so unfavourable a comparison with that of the *Chinchona Pahudiana*, during Mr. Junghuhn's management of the quinine cultivation in Java. He was, however, sufficiently convinced of the great value of the Calisaya quinine to bestow, as he did, every care on its cultivation, and thus his afore-mentioned incorrect opinion respecting the increase of plants by slips or seeds, when that opinion came to be compared with the positive fact that the *Chinchona Pahudiana* had furnished an innumerable quantity of ripe and suitable seeds, was the sole cause of the extensive development which he gave to this last-named species.

There has been so much said and written with reference to this extensive development that I have deemed it advisable to take up that subject, as I am convinced that the mode of treatment adopted by Mr. Junghuhn to that effect has given rise to very unjust opinions. The objection was, that the bark of the *Chinchona Pahudiana* was of little or no value, and, in fact, some persons went even so far as to openly assert that this species of quinine tree was no better than firewood.

But whilst it would be going to the extreme to pronounce such an opinion with regard to that species of quinine tree, it cannot, on the other hand, be denied that Mr. Junghuhn indulged in too sanguine expectations as to its future productiveness, so that here also, as in the majority of cases, the truth lies again in the mean.

Before, however, proceeding to offer any opinion on such a contested point, it is requisite for us to have a clear idea of the real object of the cultivation of quinine in Java. Should the opinion prevail—and my impression is that such an opinion would be a one-sided one—that only those trees should be propagated which deliver the best bark for the preparation of quinine, it would be, without doubt, merely necessary to cultivate the Calisaya species, and thus leave to their fate all the other kinds at present existing in Java; but it must be remembered that although the quinine bark is certainly for the most part employed in making quinine preparations, it is also used in no inconsiderable quantities by medical men for decoctions, extracts, &c., &c.; and not only in my opinion, but also in that of the well-known chemist, M. Guibourt, the bark of the *Chinchona Pahudiana* is in all probability quite suitable for the latter purposes. It will be readily concluded, therefore, that whilst the Calisaya should be the most extensively cultivated, the *Chinchona Pahudiana* and other species of quinine trees, should not be altogether lost sight of.

Other arguments might be adduced against the exclusive cultivation of the Calisaya species, amongst others that we do not yet know, for a certainty, what species are the most suitable for acclimatization in Java, so as to produce the most advantageous results.* The advantage, however, does not alone consist in the quantity of quinine which the bark of any particular species may possess, but also in the quantity of bark itself which may be supplied by any tree in a given time. For example, it is within the range of possibility that a species, with a bark less productive *per se* of quinine than that of the Calisaya, may be even more advantageously cultivated than the latter, in the event of there being a much greater quantity of bark on the one than on the other during the given time, so that in the end the relative lesser quantity of quinine substances is amply made up in another way.

The inference from the foregoing remarks is, that the blame thrown on Mr. Junghuhn,

* Moreover it is not yet an established fact that the Calisaya trees cultivated in Java are so well adapted for quinine preparation as those which have been introduced from Bolivia, for it appears by chemical analysis that some of the Calisaya barks of that island contain a somewhat larger quantity of quinidine, and, in fact, I found on one occasion nearly 3 per cent. quinidine in a bark of that kind. It is true that it was only in some cases I discovered so large a quantity of that substance, but so long as we are unacquainted with the circumstances on which the formation of quinine or quinidine depends, it would be highly imprudent to rely on any particular sort for the prosperity of the quinine cultivation.

Junghuhn, with respect to the cultivation of the *Chinchona Pahudiana*, is for the most part undeserved, when it is considered that he was only then making experiments in cultivation, for such was the real state of the case during his management, and the only objection that can be reasonably urged against him is that the number of plants which he reared of the *Chinchona Pahudiana* species was too great in proportion to that of the *Calisaya*.

After this unavoidable digression, I now resume the description of the extension of quinine cultivation under Mr. Junghuhn's management. As soon as he had obtained a quantity of suitable seed, he successively laid down new nurseries, with all that energy peculiar to him, formed sprouting beds in hitherto all but impassable forests, the haunts of rhinoceroses and wild bulls, and ran good waggon roads through the forests themselves, thus opening them out as thoroughfares. Whilst the cultivation in question was thus gradually spreading in west Java, matters were on a different footing in the eastern portion of the island, for there was only one small experimental plantation in Bezoeki, on the Ayangge mountain, with 21 plants set in 1857, and this number was diminished to 18 by the end of December of that year. This plantation was formed by Mr. Junghuhn with the laudable object of making an experiment with regard to the influence which the drier climate of east Java might exercise on the development of the quinine plant, and it is therefore to be deeply regretted that he never afterwards visited that plantation, nor acceded to my repeated offer to go and make the, in my opinion, highly necessary examination. The consequence is that, up to the present time, we are totally ignorant as to whether the drier atmosphere of the Ayangge mountain influences beneficially or otherwise the growth and quinine produce of the trees on that site. Before, however, taking any further steps to extend the quinine cultivation in west Java, it is in my opinion absolutely necessary to procure the still unsupplied data regarding the condition of the above-mentioned plantation on the Ayangge, for Mr. Melvor's experience at Ootacamund teaches us that, although extremes of draught or moisture are always prejudicial, nevertheless the quinine trees suffer less from the effects of the former than of the latter, so that it is quite possible, in fact probable, that the drier climate of east Java is more suitable for the cultivation of those trees than the relatively moist one of the west.

Mr. Junghuhn undertook the management of the cultivation in July 1856, and at that time there were 251 live plants, and 1,650 slips, most of which had not taken root; but at the end of December 1863, we had 1,151,810 quinine plants, of which 539,030 were growing in the open air, and 612,771 in the sprouting beds and nursery depôts, together with 6,830 live slips. These plants consisted of—

12,093	Chinchonæ	Calisayæ,
251	„	lancifoliæ,
89	„	succirubræ,
128	„	lanceolataæ,
1	„	micanthræ,
1,139,248	„	Pahudianæ,

which were found distributed amongst the following plantations:—

1st. Nagrak, on the Tankoeban-prahoe, 5,000 feet above the level of the sea. 2d. Tjineroean, 4,820 ditto. 3d. Tjibeurum, 4,800 ditto (the two latter plantations situate on the Great Malabar). 4th. Tji-bitoeng, 4,700 ditto, on the Goenong Wajang. 5th. Reong-goenong, 5,000 ditto. 6th. Kawah-tjiwidei, 6,000 ditto. 7th. Rantja-bolang, 5,900 ditto (the last three situate on the Kendengge mountain, between the Goenong Tiloe and the Goenong Patoea). 8th. Telaga Patengan, 4,850 ditto. 9th. Tjibodas, on the Goenong Gedeh, 4,440 ditto; and, finally, 10th. The Wonodjampi plantation, on the Ayangge mountain, 6,830 ditto.* The heights above the level of the sea refer to the inspector's dwellings, the first eight of which were erected during Mr. Junghuhn's management, and they are now occupied by permanently appointed inspectors. The residence at Tjibodas was constructed previously to the year 1856, and the last-named plantation (the 10th) has no inspector's house, but is entirely left unattended to, so that the height above mentioned, of No. 10, refers to that plantation itself. The inspectors thus charged with the superintendence of the plantations are generally non-commissioned

* I afterwards learned that subsequently to my departure from Java 16 more quinine plants were planted on the Diëng, so the number of plantations, large and small, had attained the number of 11, on 11th December 1863.

non-commissioned officers on leave of absence, enjoying a salary of 75, 100, or 125 florins per month; and the work on the plantations is carried on by natives of the country, who are paid a certain fixed sum per month, in order to secure their permanent services, and a certain other sum for labour performed, besides having lodgings rent free.

If we confine ourselves to a mere consideration of the increase in the number of quinine trees which, as we have already seen, has risen to 1,151,810, we shall certainly feel bound to declare that the result thus obtained is a favourable one; but that impression will be weakened when we come to compare the various species which compose that number, for we cannot but be struck by the proportion the *Chinchona Calisaya* bear to the *Chinchona Pahudiana*, viz., 12,093 of the former, to 1,119,248 of the latter. For although, as before observed, I do not in any way share the unfavourable opinion entertained with respect to the value of the bark of the latter quinine species, and even, as the result of my own experiments hold to the probability that, when otherwise cultivated, that species will furnish a very useful bark, nevertheless I consider it as an established fact that its bark, as hitherto brought under notice, is far inferior to that of the *Calisaya*, so that the last-named species should be the one most extensively cultivated. Whilst thus regretting that the proportion referred to is just the reverse of what, in my opinion, it should be, I am consoled by the reflection that such a fault may be easily repaired by applying to the 12,093 *Chinchona Calisaya* the mode of cultivation so successfully adopted by Mr. McIvor, for by so doing that number may be increased to at least two millions in less than two years. Had the parties whose province it was to give advice in this country to the successive ministers of the colonies, with reference to the quinine cultivation, impressed on the minds of the members of the Government the fact that the insufficient development of that cultivation was attributable to the non-extension of the *Calisaya* species by means of slips, and had they pointed out the means of remedying the defect, they would have better furthered the public interests, than by making such a useful object as the introduction of quinine trees into Java, the medium of giving vent to personal animosity, as unfortunately was the case.

It is true that a doubt has been raised as to whether the introduction of quinine cultivation into Java was, in reality, a useful undertaking. I cannot better remove such a doubt than by pointing to the fact that the English, a decidedly practical people, soon followed the example given by Holland, by cultivating quinine trees in British India; and here it may be remarked, as deserving special consideration, that in that portion of the Indies the Government is not in the position of a planter, and that it is only by way of exception that the cultivation in question has become a Government affair. The reports on the subject, which form not less than 272 folio pages of a Blue Book, published on the 20th of March 1863, by order of the British Parliament, were obligingly sent to me, together with the official reports from British India, thereby enabling me to give complete information regarding the English cultivation of quinine, information which is assuredly of much importance for Java. The information thus derived I now communicate all the more eagerly that, after having been in close connection with the quinine cultivation in Java for a period of five years, I made myself personally acquainted with the mode pursued in Ceylon and the Neilgherries, and thereby arrived at the conclusion that that mode was by far preferable to the system followed in Java, so long as I was residing there.

After the failure of the first attempt, in the year 1855, to introduce the quinine plant into British India, the three *Calisaya* plants at Darjeeling having died in a short space of time, Lord Stanley, the English Secretary of State for India, resolved, in the month of June, 1859, to send Mr. Clements Markham on a mission to South America, in order to make a collection of quinine plants and seeds, and although the plants which that gentleman brought from those parts assumed (through the effects of heat whilst traversing the Red Sea) so bad a condition on his arrival at Ootacamund, that they shortly afterwards withered away, he had during his stay in America taken such judicious and appropriate steps for securing the further transmission of a good quality of quinine seeds and plants, that his mission can only be regarded as an eminently successful one, as clearly proved by the decidedly happy results of the introduction, by means of those seeds and plants, of quinine cultivation in three separate districts of the wide-spread Anglo-Indian possessions, namely at Darjeeling, at the foot of the Himalaya; at Hakgalle, near Newera Ellia, in Ceylon; and at Ootacamund in the Neilgherries, in the Madras Presidency.

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The Chinchona plantation at Darjeeling is placed under the management of Dr. Anderson, the director of the Botanical Garden at Calcutta, who was sent in 1861 by the Governor General, Lord Canning, to Java, in order to take charge of the quinine plants, which our Government had readily promised to give him. The plants thus liberally presented by the Hollando-Indian Government form the heart of the above-mentioned plantation, which was laid down towards the end of the year 1861, and which, after having overcome many obstacles, contained 19,516 plants on the 15th of July 1864.

The Hakgalle Chinchona plantation in Ceylon, 5,200 feet above the level of the sea, is under the immediate management of Mr. MacNicoll, and superintendence in chief of Mr. G. H. K. Thwaites, the well-known botanist, and director of the Botanical Gardens at Peradenia. This plantation was formed in the beginning of the year 1861, and at the end of August 1863, contained 22,050 quinine plants.

The Chinchona plantation at Ootacamund, 7,500 feet above the level of the sea, as well as the branch one at Neddiwuttum, also in the Neilgherries, is placed under the management of the skilful and eminently practical Mr. McIvor; and should the cultivation in British India lead to good results, as no doubt will be the case, they will be mainly due to his intelligent investigations. The results, in fact, obtained in this plantation, are of such a nature as to warrant me in bestowing marked attention on it, the more so that in the month of November 1863, I thoroughly examined it during a fortnight, and thus personally became convinced of the reality of the facts communicated to me by Mr. McIvor. The first quinine seeds sprouted at Ootacamund in March 1861, and thus produced 172 young plants at the end of that month; on the 9th of the following month he received the first young healthy quinine plants to the number of 463, so that he was then in possession of 635 such plants, nearly all belonging to the *Chinchona succirubra* species, whence the red quinine bark is obtained. By the 30th of April 1861, the above-mentioned number of plants had been increased, by means of slips and "eyes," to 1,128; in the corresponding months of the two following years to respectively 31,495 and 157,704, and on the 31st of December 1863, to 277,083.

It will be seen, by the foregoing details, that the number of original quinine plants which were set at Ootacamund on the 9th of April 1861, had, by the end of December 1863, consequently within three years, increased to the surprising number of 277,083, without the importation of seeds or any new plants.

This rapid propagation of the quinine plant by means of suitable slips has been further illustrated by the following fact:—The celebrated quinologist, Mr. J. E. Howard, of London, presented to the English Government a single plant of the *Chinchona Uritusinga*, five feet high, and this tree was brought to Ootacamund on the 18th of April 1862 in a sickly condition, but having, on the 31st of May, began to recover, some slips were taken from it, and by the end of December 1863, consequently within 19 months, not less than 6,350 young plants were obtained from this single one. Now if we compare that fact with the other one, that the single plant of *Chinchona succirubra*, which Mr. Junghuhn found in Java when he first undertook the management of the quinine cultivation, in July 1856, had only produced 89 young plants by the end of December 1863, consequently, in about seven years' time we shall certainly, without any difficulty, come to the conclusion that the observations I have already made, respecting the slips planted by Mr. Junghuhn, are not only well founded, but that, in point of fact, the weak point of the mode of Java cultivation is demonstrated therein. If the method so successfully followed by Mr. McIvor for propagating the trees had been pursued with regard to the 99 Calisaya plants existing in Java in July 1856, the number of trees of that species, which, as before observed, supplies the bark most suitable for quinine preparations, would in eight years' time have amounted, according to the standard above given, to several millions, and thus the unfortunate contest respecting the *Chinchona Pahudiana* would never have arisen.

Whilst Mr. Junghuhn planted the quinine trees in the thick shade of the primitive forests, because similar trees grow in analogous situations in the countries where they are indigenous, Mr. McIvor adopted a totally different plan. When the latter received the first quinine seeds, which were those of a species wholly unknown to him, he made himself well acquainted, it is true, with all the circumstances connected with the growth of the plants in their native countries, and fortunately for him Mr. Markham happened to be at Ootacamund

at the time, and rendered him no little service with regard to the requisite information; but Mr. McIvor also asked himself the question—in what way the quinine plants should be cultivated with the view of producing, in the shortest possible time, the largest possible quantity of bark with the greatest possible amount of quinine?

Such a question can only be answered by a series of well-regulated experiments, and although Mr. McIvor himself would be the first to acknowledge that the question he himself proposed is still far from being completely solved, it is nevertheless certain that his investigations have already led to results which are assuredly deserving of being made generally known.

In consequence of a variety of experiments made by him with the seeds he had received, he discovered a way to make them sprout forth within, on an average, 14 days. Whilst at Java a bamboo pot was employed for the sprouting of each little seed; and during the latter part of my stay in that country the parties concerned only ventured so far as to place two such seeds in one pot; the mode adopted in Ootacamund (as well as in point of fact in Holland by skilful rearers of the plants in question) was to set 30 or even more seeds in one small flower pot, whereby much money and space were economized, not to make mention of the greater facility with which their growth could be attended to.

After thus ascertaining the mode of treating the quinine seeds, with the object of producing sound plants in a short space of time, the second question that arose was: in what manner the plants themselves should be cultivated in order to attain the desired end? Although, in consequence of the mode of planting in Java, namely, in the thick shade of the forests, a certain pressure was brought to bear on Mr. McIvor, he was firm enough not to abandon, but on the contrary to adhere more closely to the conviction, based on his practical experiments, that the quinine trees, according to their species, should be cultivated more or less in the open sun, at suitable heights, however, above the level of the sea, and this opinion he urged on the attention of the Governor of Madras, Sir William Denison, who was naturally enough reluctant to give his consent to the felling of trees in the already sparsely wooded Neilgherries. This high functionary, however, having full confidence in the skill and experience of Mr. McIvor, duly examined the arguments the latter gentleman adduced, and finally allowed the woods to be cleared on such sites as were deemed suitable for the cultivation in question; and at the same time Sir William entrusted the entire management of the quinine plantations in the district to Mr. McIvor, who accordingly carried out his own suggestions as already set forth.

Thus the rearing of quinine trees in the East Indies is at this moment conducted on two systems which I can best explain by comparing it with the process of raising oak trees and field timber. According to one of those systems, which, as already stated, is followed in Java, the plants, which of course must be set at a great distance one from the other, should, like oaks, grow up to high trees, and should not be cut down before the lapse of several years, for the purpose of obtaining the quinine bark; according to the other system, the one in vogue, not only in the Neilgherries, but also, although not in so consistent a manner, in Ceylon, the object is not so much to raise quinine trees as plants, which, exactly like field timber, supply a regulated quantity of bark, and are planted at a much less distance from each other.

Thus, for example, the quinine plants in the Neddiwuttum plantation, which has been laid down for 900,000 plants, and which is situate about 16 English miles from Ootacamund, are set six English feet from each other, so that they may afford reciprocal protection against the high winds which often prevail there; and, whenever a plant is sufficiently developed, the mode adopted is to cut the next one at the root, so that the number of trees in the plantation is reduced by one-half.

The plants thus cut continue to supply bark so long as their roots sprout up anew and produce plants. So soon as these new plants attain a certain growth the older ones are cut in like manner, and thus a regular quantity of quinine bark is procured. Besides this mode of securing a regular supply, another one is adopted, namely, to cut off a branch yearly from each plant, and to convert the bark on that branch into an article of commerce. The question as to which of these two systems leads to the more practical results can only, of course, be determined by experience; but one thing is already certain, viz., that I have in my possession a written statement by Mr. McIvor, to the effect

effect that before the end of December 1865 he will be able to forward to Europe between 3,000 and 5,000 English pounds weight of quinine bark, the yield of 16,000 plants set at Neddiwuttum in the months of September, October, and November, 1862. Judging by what I saw at Neddiwuttum, Ootacamund, and other parts, I do not for a moment doubt but that he will be able to keep his word; and now the only question remaining to be solved is, whether Mr. McIvor's plan for rearing quinine trees is the one most likely to produce bark containing a sufficient quantity of quinine?

As Sir William Denison was very kindly pleased to give orders by telegraph to let me have whatever I required for attaining the scientific object I had in view, I was supplied, at my request, with specimens of the various kinds of bark furnished by the Neddiwuttum and other plantations, and was thereby enabled to give an answer, on my return to Holland, to the last-mentioned question. The result of the chemical analysis of those barks, which was made by me as well as by Mr. Howard, and which I have elsewhere communicated,* was that their quinine component was perfectly satisfactory, and thus the opinion expressed by Mr. Junghuhn to the effect that the trees grown on sites fully exposed to the sun would contain too little of that component, appears to be a totally erroneous one, as indeed I suspected would turn out to be the case, judging by certain facts which had come to my knowledge during my residence in Java. The only remark which I may venture to make with respect to the English mode of cultivation is, that by far the greater number of the quinine plants in the Anglo-Indian plantations appertain to the species producing the red bark, which requires an extraordinary degree of attention, the result being that that kind of bark is quoted at 2 s. 6 d. to 8 s. 9 d. in the London market. This high price, however, arises from the scarcity of that species of bark, which will become cheaper so soon as that scarcity is replaced by a larger amount of importation; for although the red bark is in general the richest of all others in alkaloids, it is nevertheless not so productive of quinine as the good species of Calisaya, so that I am inclined to think that the quinine manufacturers will at all times give the preference to the latter.

After this brief description of the mode of cultivation, both in Dutch and British India, there will be no difficulty in answering the question, which was started some time ago, as to whether the cultivation of quinine trees should not be made over to private enterprise.

As the quinine trees in Java must, according to the present mode of cultivation adopted in that island, be several years old (at least 30 years) before they are fully capable of yielding a good quality of bark, I very much doubt whether any capitalists would be found willing to employ their capital in that way for so long a period, and I feel bound, therefore, to answer that question in the negative. The English system, on the other hand, which admits of good interest on capital within, at the most, four years, and which continues regularly progressing in that respect, is certainly one which prepares the way for the transfer in due course of time of the cultivation under consideration to private industry; and, in fact, that principle has been already acted on in part, for, at the end of December 1863, not less than 7,532 quinine plants were delivered to private individuals at Ootacamund on payment of the stipulated price of 30 cents. each plant.

Should our enlightened Government therefore abandon, as I hope will be the case, the present mode of cultivation in Java, and replace it by the English one, not only will new prospects be opened for private enterprise, but another result will ensue, one to which I may be allowed to direct special attention in a few concluding words. It is to be regretted that the summits of many high mountains in Java have been so completely stripped of trees that the Governor General, Mr. Duymaer Van Twist, was induced some time ago to intrust to Mr. Junghuhn the task of superintending the then remaining forests. As it is necessary to plant the quinine trees at a great elevation, at least at a higher one than the coffee plantations, the English mode of cultivation would afford the means of covering those naked summits again with woods, even if it were only with a low growth of timber. The cost of planting would be amply recovered by the produce of the quinine bark thereby obtained, and the trees, when stripped of the bark, would supply the fuel now so scarce in that country.

Dr. J. E. De Vrij.

The Hague, 12 November 1864.

* "Pharmaceutical Journal," June, July, and August 1864.

— No. 37. —

From the Government of Madras to the Secretary of State for India.

Madras, 23 January 1865.

WE have the honour to forward for your information the accompanying Tabular Report on the number, condition, &c., of the Chinchona plants on the Neilgherries, on the 31st December 1864.

Enclosure in No. 37.

REPORT on the Number, Distribution, and Condition of Chinchona Plants on the Neilgherries, on the 31 December 1864.

Species.	Botanical Names.	Commercial Names.	Number of Plants.	Value per Lb. of Dry Bark in the London Market.		REMARKS.
				s. d.	s. d.	
1	<i>C. succirubra</i> - -	Red Bark - -	138,119	2 6	to 8 9	The number of plants permanently planted out in the plantations remain the same as last month, namely, 185,361. The increase by propagation is 24,006, being 3,024 plants above the average of the last six months, making the total number of plants at the end of the month 499,452.
2	<i>C. calisaya</i> - -	Yellow Bark - -	2,560	2 10	to 7 0	
3	<i>C. officinalis</i> , var. <i>Condaminea</i> (<i>C. urituisinga</i>).	Original Loxa Bark	2,705	2 10	to 7 0	
4	<i>C. officinalis</i> , var. <i>Bonplandiana</i> (<i>C. chahuarguera</i>).	Select Crown Bark -	324,276	2 10	to 7 0	
5	<i>C. crespilla</i> - -	Fine Crown Bark -	2,367	2 10	to 6 0	
6	<i>C. lancifolia</i> - -	Pitayo Bark - -	28	1 8	to 2 10	
7	<i>C. nitida</i> - -	Genuine Grey Bark -	8,500	1 8	to 2 9	
8	<i>C. Species</i> without name.	Fine Grey Bark - -	2,786	1 8	to 2 10	
9	<i>C. micrantha</i> - -	Grey Bark - -	14,314	1 8	to 2 9	
10	<i>C. Peruviana</i> - -	Finest Grey Bark -	3,372	1 8	to 2 10	
11	<i>C. Pahudiana</i> - -	Unknown - -	425	Worthless.		
TOTAL Number of Plants - - -			499,452			

TABLE II.

MEMORANDUM of the Growth of Eleven Plants of *C. succirubra*, planted on the Second Denison Plantation at Neddivuttum, on the 30 August 1862.

Number of Plants.	Height in Inches when Planted on 30 August 1862.	Height in Inches on 30 November 1864.	Height in Inches on 31 December 1864.	Growth in Inches during Dec. 1864.	By whom Planted.
1	28	111	112	1	His Excellency Sir W. Denison. J. W. Breeks, Esq. Dr. Sanderson. J. D. Sim, Esq. Lieutenant McLeod. P. Grant, Esq. Plant cut down for bark.
2	16½	100½	101	½	
3	19	104½	104½	½	
4	15	98½	98½	½	
5	27	117	117	0	
6	20	88	89	1	
7	20	107½	107½	½	
8	18	109	109	0	
9	20	111½	111½	0	
10	20	112½	113	½	
11	18	98	98½	½	
12	—	52	53	1	

TABLE II. exhibits the growth of eleven plants of *Chinchona succirubra* planted out by his Excellency the Governor and other gentlemen at Neddivuttum, on the 30th August 1862; the average growth of these plants during the month is ½ inch, being two inches under the growth of last month.

One of the two plants cut down on the 20th March 1863 for the bark, submitted to Mr. Howard for analysis, has made strong shoots of 53 inches in height, giving the growth of one inch during the month.

TABLE III.

SHOWING the Height of Twelve Plants of *C. officinalis*, planted on the Dodabetta Plantation at Ootacamund, on 30 September 1863.

Number of Plants.	Height in Inches when Planted on 30 September 1863.	Height in Inches on 30 November 1864.	Height in Inches on 31 December 1864.	Growth in Inches during December 1864.	REMARKS.
1	19	65	67½	2½	The 12 plants of <i>Chinchona officinalis</i> (a shrubby species) on the Dodabetta plantation, give an average growth of 2½ inches, or ¼ of an inch below the growth of last month.
2	14½	55½	58½	3	
3	28	70	73	3	
4	22	72	75	3	
5	21½	66½	69	2½	
6	28	73	76	3	
7	22½	65	68	3	
8	21½	65½	68	2½	
9	21½	72½	75	2½	
10	19½	68	71½	3½	
11	24	69½	72½	3	
12	24	69	71½	2½	

TABLE IV.

REGISTER of Chinchona Plants Distributed.

NAMES.	STATION.	Number of Plants.
Mr. F. N. Maltby	Travancore	16
Dr. Junghuhn	Java	56
Mr. A. R. Lascelles	Ootacamund	12
Mr. Anderson	Jamaica	2
Dr. Wiehe	Bombay	10
Dr. T. Anderson	Calcutta	554
Dr. Jamieson	Sabaranpore	107
Professor Lees	Calcutta	547
Rajah of Travancore	Travancore	521
Major Morgan	Ootacamund	1,534
Mr. E. T. Fitzgerald	Calcutta	558
Mr. J. W. B. Money	- ditto -	1,369
Dr. W. Bourne	- ditto -	532
Captain Cox	Wayn 1	6
Mr. Hollock	- ditto -	2
Mr. T. Sheffield	Ootacamund	12
Dr. F. Day	Cochin	100
Mr. Brown	Tillicherry	12
Mr. J. Hall	Ootacamund	144
Mr. J. Knop	- ditto -	18
Captain Lees	Bengal	281
Mr. W. H. Rayne	Manantoddy	424
Reverend — Sawyer	Ootacamund	1,018
Mr. Friend	- ditto -	112
Mr. Hollock	- ditto -	1
Mr. J. Pierie	Seegoor	12
Colonel Scott	Ootacamund	1,226
Mr. Berend	Cachar	275
Rev. J. Hunter	Coonoor	12
Mr. J. Mullaly	- ditto -	24
Mr. W. H. Stanes	- ditto -	1,263
Colonel R. Cooper	Kotagherry	12
Mr. F. Cockburn	- ditto -	12
Colonel Woodfall	Coonoor	12
Mr. C. Anderson	- ditto -	24
Colonel Angelo	Ootacamund	12
Rev. E. Laseron	- ditto -	12
Captain R. N. Taylor	Coorg	96
Major W. Agnew	Assam	139
Mr. V. H. Levinge	Madura	12
Chief Commissioner of	Nagpore	28

The number of plants issued to the public is 200, making the total number of plants distributed 52,357.

TABLE IV.—REGISTER of Chinchona Plants Distributed—*continued.*

NAMES.	STATION.	Number of Plants.	REMARKS.
Mr. Fletcher - - - -	Ootacamund - - - -	24	
Gool Mahomed - - - -	- ditto - - - -	20	
General McCleverty - - - -	New Zealand - - - -	23	
Mr. W. Robinson - - - -	Kotagherry - - - -	30	
Mr. Crake - - - -	Wainad - - - -	12	
Mr. H. R. Dawson - - - -	Seegoor - - - -	12	
Captain Mann - - - -	Coorg - - - -	48	
Mr. E. Roberts - - - -	- ditto - - - -	530	
Mr. H. Russell - - - -	Wainad - - - -	12	
Rev. — Wait - - - -	Coonoor - - - -	2	
Collector of Belgaum - - - -	Belgaum - - - -	28	
Collector of Honore - - - -	Honore - - - -	28	
Dr. Ross - - - -	- ditto - - - -	15	
His Excellency the Governor - - - -	Bombay - - - -	158	
Mr. H. Hinde - - - -	Waynad - - - -	12	
Mr. E. B. Thomas - - - -	Coonoor - - - -	12	
Rajah of Poonganoor - - - -	Boonganoor - - - -	12	
Major Grant - - - -	Wellington - - - -	226	
Messrs. Thomson, Shaw, & Co. - - - -	Poonganoor - - - -	28	
Mr. J. H. Trinson - - - -	- ditto - - - -	31	
Dr. Muller - - - -	Melbourne - - - -	28	
Mr. Tyrrell - - - -	Mysore - - - -	12	
Dr. Sayers - - - -	Vellore - - - -	12	
Major C. P. Taylor - - - -	Ootacamund - - - -	5,250	
Dr. Wilson - - - -	- ditto - - - -	6	
Mr. Schnarie - - - -	- ditto - - - -	15,000	
Captain Fuller - - - -	Coonoor - - - -	266	
Mr. Drummond - - - -	Ootacamund - - - -	224	
Captain Jennings - - - -	- ditto - - - -	1,756	
Lieut. E. B. Montmorency - - - -	Bangalore - - - -	6	
Mr. McHutchin - - - -	Ootacamund - - - -	3	
Colonel Molesworth - - - -	- ditto - - - -	6	
Mr. C. Gray - - - -	Coonoor - - - -	12	
Mr. H. B. Leddell - - - -	Ootacamund - - - -	12	
Mr. Minchin - - - -	Waynad - - - -	1,600	
His Excellency the Governor - - - -	Vizagapatam - - - -	35	
Mr. R. F. Phillips - - - -	Kotagherry - - - -	1,117	
Colonel Cooke - - - -	- ditto - - - -	24	
Mr. G. J. Glasson - - - -	Waynad - - - -	1,000	
Dr. Macpherson - - - -	Mercara - - - -	400	
Mr. W. H. Kerr - - - -	Coorg - - - -	3,100	
Mr. James - - - -	Ootacamund - - - -	1,000	
Colonel Whish - - - -	Bengal - - - -	82	
Mr. K. Mair - - - -	Calcutta - - - -	1,180	
Mr. W. Shakespear - - - -	- ditto - - - -	61	
Mr. E. E. Meakin - - - -	- ditto - - - -	168	
Mr. C. Ackland - - - -	- ditto - - - -	150	
Mr. K. McIver - - - -	- ditto - - - -	124	
Mr. Havelock - - - -	Ootacamund - - - -	12	
Mr. H. de Facien - - - -	Kartairy - - - -	6,821	
Major Sweet - - - -	- ditto - - - -	102	
Captain Campbell - - - -	Bangalore - - - -	6	
Royal Gardens - - - -	Mauritius - - - -	36	
Hon. W. R. Arbuthnot - - - -	Waynad - - - -	93	
Mr. H. Maxwell - - - -	Bombay - - - -	50	
Mrs. C. Smith - - - -	Waynad - - - -	22	
Captain Beckley - - - -	Wellington - - - -	200	
TOTAL Number of Plants - - - -		52,357	

Ootacamund,
12 January 1865.

(signed) *W. G. McIvor,*
Superintendent Government Chinchona Plantations.

— No. 38. —

From the Government of Madras to the Secretary of State for India.

Madras, 22 February 1865.

WE have the honour to forward for your information the accompanying Tabular Report on the number, condition, &c., of the Chinchona plants on the Neilgherries on the 31st January 1865.

Enclosure in No. 38.

REPORT on the Number, Distribution, and Condition of Chinchona Plants on the Neilgherries, on the 31 January 1865.

No. of Specimen.	Botanical Names.	Commercial Names.	Number of Plants.	Value per Lb. of Dry Bark in the London Market..		REMARKS.
				s. d.	s. d.	
1	<i>C. succirubra</i> - -	Red Bark - -	144,340	2 6 to 8 9.		The number of plants permanently planted out in the plantations remains the same as last month, namely, 165,351. The increase by propagation is 17,231, being 2,422 plants under the average of the last six months, making the total number of plants at the end of the month 516,683.
2	<i>C. Calisaya</i> - -	Yellow Bark - -	2,580	2 10 to 7 -		
3	<i>C. officinalis</i> , var. <i>Condaminia</i> (<i>C. Uritusinga</i> .)	Original Loxa Bark	2,981	2 10 to 7 -		
4	<i>C. officinalis</i> , var. <i>Bonplandiana</i> (<i>C. Chahuarguera</i>).	Select Crown Bark -	334,716	2 10 to 7 -		
5	<i>C. crespilla</i> - -	Fine Crown Bark -	2,498	2 10 to 6 -		
6	<i>C. lancifolia</i> - -	Pitayo Bark - -	30	1 8 to 2 10		
7	<i>C. nitida</i> - -	Genuine Grey Bark	8,500	1 8 to 2 9		
8	<i>C. Species</i> without name.	Fine Grey Bark -	2,786	1 8 to 2 10		
9	<i>C. micrantha</i> - -	Grey Bark - -	14,555	1 8 to 2 9		
10	<i>C. Peruviana</i> - -	Finest Grey Bark -	3,372	1 8 to 2 10		
11	<i>C. Pabudiana</i> - -	Unknown - -	425	Worthless.		
TOTAL Number of Plants - - -			516,683			

TABLE II.

MEMORANDUM of the Growth of Eleven Plants of *C. succirubra*, planted on the Second Denison Plantation at Neddivuttum, on 30 August 1862.

Number of Plants.	Height in Inches when Planted, 30 August 1862.	Height in Inches on 31 December 1864.	Height in Inches on 31 January 1865.	Growth in Inches during January 1865.	By whom Planted.
1	23	112	113½	1½	His Excellency Sir W. Denison. J. W. Breeks, Esq. Dr. Sanderson. J. D. Sim, Esq. Lieutenant McLeod. P. Grant, Esq. Plant cut down for bark.
2	16½	101	102	1	
3	19	104½	105½	½	
4	15	98½	99	½	
5	27	117	117½	½	
6	20	89	90	1	
7	20	107½	108	½	
8	18	109	109½	½	
9	20	111½	112	½	
10	20	113	114	1	
11	18	98½	98½	0	
12	-	53	53½	½	

TABLE II. exhibits the growth of 11 plants of *Chinchona succirubra* planted out by his Excellency the Governor, and other gentlemen, at Neddivuttum, on the 30th August 1862. The average growth of these plants during the month is ¾ths of an inch, being about ¼ an inch above the growth of last month.

One of the two plants cut down on the 20th of March 1863 for the bark, submitted to Mr. Howard for analysis, has made strong shoots of 53½ inches in height, giving the growth of ½ an inch during the month.

TABLE III.

SHOWING the Height of Twelve Plants of *C. officinalis*, planted on the Dodabetta Plantation at Ootacamund, on the 30th September 1863.

Number of Plants.	Height in Inches when Planted, on 30 September 1863.	Height in Inches on 31 December 1864.	Height in Inches on 31 January 1865.	Growth in Inches during January 1865.	REMARKS.
1	19	62½	70	2½	The 12 plants of <i>C. officinalis</i> (a shrubby species) on the Dodabetta Plantation, give an average growth of 2½ inches, or ¼th of an inch below the growth of last month.
2	14½	58½	61½	3	
3	28	73	75	2	
4	22	75	78½	3½	
5	21½	69	71½	2½	
6	28	76	79	3	
7	22½	68	71	3	
8	21½	68	71	3	
9	21½	75	78	3	
10	19½	71½	73	1½	
11	24	72½	75	2½	
12	24	71½	74	2½	

TABLE IV.

REGISTER of Chinchona Plants Distributed.

NAMES.	STATION.	Number of Plants.
Mr. F. N. Maltby - - - -	Travancore - - - -	16
Dr. Junghuhn - - - -	Java - - - -	56
Mr. A. R. Lascelles - - - -	Ootacamund - - - -	12
Mr. M. Anderson - - - -	Jamaica - - - -	2
Dr. Wiehe - - - -	Bombay - - - -	10
Dr. T. Anderson - - - -	Calcutta - - - -	554
Dr. Jamieson - - - -	Saharanpore - - - -	107
Professor Lees - - - -	Calcutta - - - -	547
Rajah of Travancore - - - -	Travancore - - - -	521
Major Morgan - - - -	Ootacamund - - - -	1,534
Mr. E. T. Fitzgerald - - - -	Calcutta - - - -	558
Mr. J. W. B. Money - - - -	ditto - - - -	1,369
Dr. W. Bourne - - - -	ditto - - - -	532
Captain Cox - - - -	Wynad - - - -	6
Mr. Hollock - - - -	ditto - - - -	2
Mr. T. Sheffield - - - -	Ootacamund - - - -	12
Dr. F. Day - - - -	Cochin - - - -	100
Mr. Brown - - - -	Tellicherry - - - -	12
Mr. J. Hall - - - -	Ootacamund - - - -	144
Mr. J. Knop - - - -	ditto - - - -	18
Captain Lees - - - -	Bengal - - - -	281
Mr. W. H. Rayne - - - -	Manantoddy - - - -	424
Rev. — Sawyer - - - -	Ootacamund - - - -	1,018
Mr. Frend - - - -	ditto - - - -	112
Mr. Hollock - - - -	ditto - - - -	1
Mr. J. Pierie - - - -	Seegoor - - - -	12
Colonel Scott - - - -	Ootacamund - - - -	1,226
Mr. Berend - - - -	Cachar - - - -	275
Rev. J. Hunter - - - -	Coonoor - - - -	12
Mr. J. Mullaly - - - -	ditto - - - -	24
Mr. W. H. Stanes - - - -	ditto - - - -	1,262
Colonel R. Cooper - - - -	Kotagherry - - - -	12
Mr. F. Cockburn - - - -	ditto - - - -	12
Colonel Woodfall - - - -	Coonoor - - - -	12
Mr. C. Anderson - - - -	ditto - - - -	24
Colonel Angelo - - - -	Ootacamund - - - -	12
Rev. E. Lason - - - -	ditto - - - -	12
Captain R. N. Taylor - - - -	Coorg - - - -	96
Major W. Agnew - - - -	Assam - - - -	139
Mr. V. H. Levinge - - - -	Madura - - - -	12
Chief Commissioner of Nagpore - - - -	Nagpore - - - -	28
Mr. Fletcher - - - -	Ootacamund - - - -	24
Gool Mahomed - - - -	ditto - - - -	20

Not having issued any plants to the public during the month, the total number of plants distributed remain the same as last month, viz., 52,867.

TABLE IV.—Register of Chinchona Plants Distributed—*continued.*

NAMES.	STATION.	Number of Plants.	REMARKS.
General M'Cleverty	New Zealand	28	
Mr. W. Robinson	Kotagherry	30	
Mr. Crake	Wynad	12	
Mr. H. R. Dawson	Seegoor	12	
Captain Mann	Coorg	48	
Mr. E. Roberts	ditto	530	
Mr. H. Russell	Wynad	12	
Reverend — Wait	Coonoor	2	
Collector of Belgaum	Belgaum	28	
Collector of Honore	Honore	28	
Dr. Ross	ditto	15	
His Excellency the Governor	Bombay	158	
Mr. H. Hinde	Wynad	12	
Mr. E. B. Thomas	Coonoor	12	
Rajah of Poonganoor	Poonganoor	12	
Major Grant	Wellington	226	
Messrs. Thomas, Shaw & Co.	Poonganoor	28	
Mr. J. H. Trinson	ditto	31	
Dr. Muller	Melbourne	28	
Mr. Tyrrell	Mysore	12	
Dr Sayers	Vellore	12	
Major C. P. Taylor	Ootacamund	5,250	
Doctor Wilson	ditto	6	
Mr. Schnarrie	ditto	15,000	
Captain Fuller	Coonoor	266	
Mr. Drummond	Ootacamund	224	
Captain Jennings	ditto	1,756	
Lieut. H. B. Montmorency	Bangalore	6	
Mr. McHutchin	Ootacamund	3	
Colonel Molesworth	ditto	6	
Mr. C. Gray	Coonoor	12	
Mr. H. B. Leddell	Ootacamund	12	
Mr. Minchin	Wynad	1,600	
His Excellency the Governor	Vizagapatam	35	
Mr. R. F. Phillips	Kotagherry	1,117	
Colonel Cooke	ditto	24	
Mr. G. J. Glasson	Wynad	1,000	
Dr. Macpherson	Mercara	400	
Mr. W. H. Kerr	Coorg	3,100	
Mr. James	Ootacamund	1,000	
Colonel Whish	Bengal	82	
Mr. K. Mair	Calcutta	1,180	
Mr. W. Shakespear	ditto	61	
Mr. E. B. Meakin	ditto	168	
Mr. C. Ackland	ditto	150	
Mr. K. M'Iver	ditto	124	
Mr. Havelock	Ootacamund	12	
Mr. H. de Facien	Kartairy	6,821	
Major Sweet	ditto	102	
Captain Campbell	Bangalore	6	
Royal Gardens	Mauritius	86	
Honourable W. R. Arbuthnot	Wynad	93	
Mr. H. Maxwell	Bombay	50	
Mrs. C. Smith	Wynad	22	
Captain Beekley	Wellington	200	
TOTAL Number of Plants		52,357	

Ootacamund,
15 February 1865.

(signed) *W. G. McIvor,*
Superintendent Government Chinchona Plantations.

— No. 39. —

From the Government of Madras to the Secretary of State for India.

Madras, 14 March 1865

1. WE have the honour to forward the accompanying very satisfactory Report from Mr. McIvor on the Government Chinchona Plantations and Botanical Gardens, for the official year 1863-64, together with our Proceedings thereon, dated 9th instant, No. 273.

2. You will observe from paragraphs 39 and 40 of the Report that the seeds of Chinchona Pitayensis, received by Mr. McIvor in April last, have entirely failed; and we request that you will endeavour to procure and forward to us a further supply of fresh seeds of these plants.

— No. 40. —

From *W. G. McIvor, Esq.*, Superintendent Government Chinchona Plantations to the Honourable *A. J. Arbuthnot*, Chief Secretary to Government.

Sir,

Ootacamund, 9 July 1864.

1. I HAVE the honour to forward herewith the Report on the Government Chinchona Plantations and Botanical Gardens for the official year 1863-64.

2. As modifications in our system of cultivation have been found necessary, and as it may be inconvenient to print the whole of the report in pamphlet form, 6 x 9½ inches, I would respectfully solicit the favour of 300 copies of paragraphs, 9 to 13 and 24 to 38 inclusive, be printed and furnished to me, in order that they may be attached to "Notes on Cultivation" published in 1863, and distributed to cultivators.

— No. 41. —

REPORT on the Government Chinchona Plantations and Botanical Gardens for 1863-64.

Introductory observations.

Increase of propagation.

Height and growth of plants.

Increase in thickness of stems, and growth of lateral branches.

Condition of plants on Dodabetta plantation; elevation 8,000 feet. Make less perpendicular growth, more robust than at lower elevations.

well in all exposures on this

Major W. A. Fletcher
Mr. V. H. Leitch
Chief Commis
Mr. Fletcher
Gool Mahomed

1. NOTWITHSTANDING the unusually trying seasons of the past official year, it affords me much satisfaction to be able to state, that our Chinchona plants have, in every respect, made most satisfactory progress. In the propagation still greater results have been obtained than those previously described, the maximum monthly produce of 32,408 plants were obtained in February last, the average being 15,326. The oldest plants, viz., those permanently planted out in August 1862, have attained heights varying from 6 to 9 feet with thick stems well furnished with lateral branches, and presenting as robust and healthy an appearance as could be wished. Like most trees of their age these plants are not now making so much perpendicular growth as they did in the first year, in consequence of the number of branches thrown out, whereby the direct flow of sap is diverted from the leading shoots; the plants nevertheless are gaining in thickness more than they have hitherto done. The Chinchona officinalis, Bonplandiana, and crespilla have been found to succeed best on the Dodabetta plantation (about 8,000 feet elevation), where the plants are robust and luxuriant, although not making so great perpendicular growth as at lower elevations. The 1st Dodabetta plantation possesses every exposure and many varieties of soil, and over the whole of this site these three species have been found to thrive well. The result of this year's analysis has also established an extraordinary increase in the yield of alkaloids, showing the product to be 6 per cent. of rough alkaloids, while the previous analysis gave 4.3 per cent. From these observations

observations it is plain that Peruvian bark will now be secured to India as one of its products. The cultivation of these very valuable plants has produced results far beyond our original expectations, and now that we have obtained considerable experience in their management, greater progress may reasonably be expected. With these preliminary remarks, I proceed to particulars which, for the sake of convenience, are arranged under the following heads :

Progress of the plants exceeds original expectations.

	Paras.
1. Growth and condition of plants - - - - -	2 to 13
2. Cultivation, results obtained by private planters in the	14 to 15
3. " prospects of its spread and increase - - - - -	16
4. " influence of woods on rain-fall and climate - - - - -	17 to 23
5. " modification of former treatment - - - - -	24 to 28
6. " under the shade of living trees and in the open ground - - - - -	29 to 30
7. " effects of storms and of wet and dry weather on - - - - -	31 to 33
8. Gathering of the bark and treatment of plant for this purpose - - - - -	34 to 38
9. Chinchona Pitaycensis, attempt to introduce, value, &c.,	39 to 40
10. Establishments - - - - -	41
11. Progress of operations - - - - -	42 to 46
12. Botanical Gardens - - - - -	47 to 48
13. Concluding remarks - - - - -	49

Heads of report.

Appendix A.—Accounts from commencement of operations to 30th April 1864.

- Do. B.—Meteorological observations - Neddivuttum.
- Do. C. Ditto - ditto - Ootacamund.

2. Our first plants were permanently planted on the Neddivuttum plantation in August 1862. Eleven plants of *C. succirubra* selected for measurement, planted on the 30th idem by his Excellency Sir William Denison and other gentlemen, have made an average growth of 3 feet from the date of being planted to the 30th April 1863 (nine months), and from the 1st May 1863 to 30th April 1864, 2 feet 11 inches; this it may be estimated is 3 inches in excess of the average growth of the whole of the plants of this species throughout the plantations; the older plants have gained much in thickness during the last year, and thrown out many strong branches varying from 1 to 5 feet in length.

Growth and condition of plants on the 1st and 2nd Denison plantations at Neddivuttum.

Attained 3 feet in height in first nine months;

2 feet 11 inches in the preceding 12 months.

Increased considerably in thickness and lateral growth.

3. The bark has also much improved, the thickness having increased considerably; the transverse marking characteristic of the finest Peruvian bark becoming very apparent, and rudimentary lichens and mosses have begun to develop themselves on the bark of the older plants, while their sturdy and robust habit indicates, beyond all doubt, that the Chinchona, in its new home, has found conditions quite as favourable to its growth and full development as in the most favourable localities on the Andes. The above remarks refer principally to the *C. succirubra*, that species being more extensively planted on the Denison plantations, and found to thrive well at elevations varying from 4,000 to 6,000 feet.

Favourable appearance of bark.

Robust habit, indicating existence of as favourable conditions to growth in this locality as on the Andes.

C. succirubra or red bark, flourishing at elevations of 4,000 and 6,000 feet.

4. The *C. Calisaya* on the same plantations gives an average annual perpendicular growth of 2 feet 4 inches, or 7 inches less than that of *C. succirubra*, the stems however have not increased in proportion; in fact, the stems of this valuable species do not give one-half the average diameter of plants of *C. succirubra* of the same age, and consequently not more than one-half the quantity of bark in the same period of growth, the plants are nevertheless healthy and robust; yet, in a commercial point of view, its comparative slow growth will, I fear, operate against its extensive cultivation.

C. Calisaya or yellow bark, of slower growth than *C. succirubra*.

Producing only half quantity of bark in the same period. Plants healthy and robust.

5. The *C. micrantha*, *Peruviana*, and *nitida*, have maintained an average growth almost identical with that of *C. succirubra*, viz., 2 feet 8 inches, but the bark formed by these species is fully one-fifth thinner than that of the *C. succirubra*.

The *C. micrantha*, *Peruviana*, and *nitida* or grey barks, made annual growth of 2 feet 8 inches.

C. officinalis or crown bark, on Markham plantation.

C. succirubra and *Calisaya*.

On the Wood plantation at Pykara only two species planted, viz. *C. succirubra* or red bark, and *C. officinalis* or crown bark.

1st Dodabetta plantation, elevation 7,830 to 8,350 feet.

Too cold for *C. micrantha* and *C. succirubra*.

Here all species of crown bark thrive better than at lower elevations.

The important fact is established, that these species may be successfully cultivated all over the plateau of the Neilgherries.

thus opening an extensive field for enterprise;

and places cultivator in healthy and invigorating climate.

C. succirubra grows at elevations from 3,000 to 6,000 feet.

The most hardy of all the species.

5,000 feet the best elevation for *C. Calisaya* or yellow bark.

Grey barks thrive best at elevations of about 4,500 to 6,000 feet.

Crown barks at elevations from 7,000 to 8,500 feet.

Makes more perpendicular growth at lower elevations, but is not so robust.

Two plants of *C. lancifolia*, Pitayo bark, planted out at an elevation of 7,600 feet, appears to require the same elevation as the crown barks.

Results obtained by private planters in the cultivation of chinchona.

In the first instance great loss of plants sustained by Professor Lees and M. de Facien, experience suggested a remedy, and now successful.

Successful also in North-West Provinces, Mahableshwar, Belgaum, and Honore; Darjeeling; Assam and Cachar; Wynaad;

On the eastern slopes of the Neilgherries.

6. About 25,000 plants of *C. officinalis*, planted on the Markham plantation (elevation 5,000 to 6,000 feet) have grown taller, but not so robust as plants at higher elevations. Here however the *C. succirubra* and *Calisaya* have made growth quite equal to any of the plants of the species on the Denison plantation.

7. On the Wood plantation at Pykara, the *C. succirubra* and *officinalis* only have been planted, and have made progress equal to the plants at Neddivuttum.

8. On the 1st Dodabetta plantation (elevation varying from 7,830 to 8,350 feet), the progress of the *C. succirubra*, and *C. micrantha* has been unsatisfactory, the elevation being apparently too great; but the *C. officinalis*, *Bonplandina* (*Condaminea*), and *crepillia* have succeeded better than on any other of our plantations, that is, the plants have grown more robust and luxuriant, and this even on the most exposed parts of the plantation; and the important fact is now established, that these three species can, with ordinary care and skill, be successfully cultivated over the whole of the plateau of the Neilgherries, thus opening out an immense field for the development of enterprise and energy, with profitable employment of time and capital, and, in addition, the cultivator will be placed in perhaps the most healthy and invigorating climate in the world.

9. Forming an opinion on our experience up to the present time, the elevations best suited to the growth of the different species of chinchona appears to be in this latitude for the *succirubra*, from 3,000 to 6,000 feet, probably thriving best at altitudes from 4,500 to 6,000. This is perhaps the hardiest species in cultivation, bearing, without material injury, greater extremes of heat and cold than any of the other species yet introduced.

10. *C. Calisaya* thrives best at an elevation of about 5,000 feet; it appears not to bear a high temperature, although in the Wynaad district it grows at 3,000 feet.

11. The *C. Peruviana*, *nitida*, and *micrantha* grow well at elevations of 4,500 feet, and in sheltered localities at 6,000 feet.

12. *C. officinalis* and its varieties, flourish best at elevations from 7,000 to 8,500 feet; it makes rapid perpendicular growth at lower elevations, but is not so robust and luxuriant.

13. Of the *C. lancifolia*, only two plants have been tried at an elevation of 7,600 feet; these stood the cold of last winter without injury, and the species may probably be found to require the same elevations as *C. officinalis* and its varieties.

14. Upwards of 60 persons have, in a greater or less degree, undertaken the cultivation of chinchona, but, as was to be expected, with varied results; the efforts of some being highly successful, while others met with comparative failures; among the most unsuccessful attempts may be mentioned those of Professor Lees and M. de Facien, both of these gentlemen, in the first instance, lost nearly four-fifths of their plants either in transit or in the nurseries. Experience, however, has pointed out a remedy; and I learn from Mr. Lees' superintendent that his plants are now doing well, and that he is propagating them at the rate of 200 per mensem. M. de Facien also writes, that his plants "are, since the shade has been removed, growing as they never did before."

15. In the North-West Provinces considerable success has been obtained, as also in Mahableshwar, Belgaum, Honore, and elsewhere in the Bombay Presidency. From Darjeeling I learn that Mr. Fitzgerald received all his plants in excellent condition. From Assam and Cachar the accounts are varied. The Wynaad coffee planters have been generally successful with the plants forwarded to them, and on the eastern side of these hills a similar success has been gained. I learn

I learn from Mr. Mullaly that the plants he received have made great progress. In Coorg and Nuggur the success seems to be general, and several planters there contemplate embarking largely in the cultivation. It will be observed that in little more than two years upwards of 31,000 chinchona plants have been supplied from Ootacamund to every district in India considered suitable to their growth.

In Coorg and Nuggur the cultivation most successful and encouraging.
31,000 chinchona plants supplied from Ootacamund to every district in India suitable to their growth.

16. The cultivation is one in which planters are eager to embark, as in fact it offers advantages which no other on the Neilgherries possesses. It promises a greater return on the capital invested than coffee, while the cultivation can be carried on in a healthy climate; the plants, when once established, are easily managed; the preparation of the bark is much more simple than that of the manipulation of tea, and after three years' growth the plantations can be maintained at little cost. These advantages are sufficiently understood and recognised to induce a number of cultivators to enter the field; consequently the applications for plants have been numerous, many of these, however, to the extent of upwards of 50,000 plants, have lately been relinquished in consequence of the applicants being unable to procure the land they had selected, being informed that it was reserved. The loss of time and trouble thus incurred has had the effect of discouraging further applications; the more especially as an impression prevails that no forest land on the Neilgherries will in future be sold. I submit that this impediment may be removed by the reserved lands being marked on a map kept in the Collector's office for reference; this would facilitate the extension of chinchona cultivation, as parties would then select unreserved land with a certainty of its being put up to auction three months after date of application. I make these remarks as all the lands on the slopes and on the plateau of the Neilgherries is well suited to the growth of the different species of chinchona, and in a philanthropic as well as revenue point of view it seems desirable that all obstructions be removed, and every legitimate encouragement afforded to bring all available lands under cultivation.

Prospects of the spread and increase of chinchona cultivation.

Inducements to cultivate chinchona in preference to other products.

Many speculators have undertaken the cultivation of chinchona.

50,000 plants relinquished by applicants in consequence of difficulty in procuring land.

On application, informed it was reserved.

Suggests that the lands reserved be marked on a map kept in the Collector's office for reference.

All the lands on the Neilgherries suitable to the growth of chinchona.

Desirable to remove impediments, and encourage extension of the cultivation.

17. In the preceding paragraph it has been stated that upwards of 50,000 chinchona plants have been relinquished, owing to the difficulty of procuring land, in consequence, I am informed, of an opinion that felling the forests on the Neilgherries causes a deterioration of climate and deficiency in the rainfall, which it is stated does not now extend so far into the Coimbatore district as formerly, owing to the forests on the Neilgherries having been felled for the cultivation of coffee and other products. If this impression could be shown to be correct, it would be important to maintain the fertility of the Coimbatore district by preserving the natural forests on the Neilgherries. But theory and observation, combined with experience of practical effects, prove this conclusion to be erroneous. The Neilgherries, like other high mountain ranges, generate and are covered by a cold stratum of air which condenses the moisture contained in the warm atmosphere in its passage from the sea; hence, if our hills were 4,000 feet lower, the temperature of the stratum of air would be increased, consequently its condensing powers reduced, and thus the rains at Coimbatore would be nearly as copious during the western monsoon as on the Malabar coast. On the contrary, were the Neilgherries 7,000 or 7,500 feet above their present elevation, then not a drop of rain would pass over the hills, as every particle of moisture in the heated air from the sea would be precipitated by coming in contact with a freezy atmosphere; in this case not only Coimbatore, but the whole of the eastern side of the hills would be devoid of rain, while torrents would fall on the western face, as exemplified in many parts of the Andes and the Himalayas, in short the same effect takes place in a greater or less degree of all mountain ranges according to their elevation. On the sea face of the Scandinavian Alps, there is an annual rainfall of 80·12 inches, while on the other side the mean annual fall is only 20 inches.

Influence of trees on rainfall and climate.

Forest land reserved in consequence of an impression that clearing the trees causes a deficiency of rain on the hills and the Coimbatore district.

Impression erroneous.

In south-west monsoon rainfall in the Coimbatore district, dependent on the elevation and temperature of Neilgherries.

Examples.

Trees increase rainfall by increasing cold stratum of air.

More effectually deprive clouds of moisture in passing over the Neilgherries.

The more trees on the Neilgherries the less rain at Coimbatore.

Evaporation great cooling agent. A tree of 45 feet in height, covering 100 square feet of ground, adds 80 times to the evaporating surface, without completely destroying the evaporation from the ground it covers.

Leaf evaporates one-fifth part of water raised from the same surface of moist ground, and one-fortieth part of that raised from the surface of water.

When the air becomes saturated, evaporation ceases, and leaves imbibe moisture.

In wet weather, trees increase rainfall and deposit of dew.

In dry weather a counterbalancing agency at work, making trees a far greater drain on the springs of the Neilgherries than a source of supply.

Trees draw the moisture they evaporate from considerable depth, and thus intercept its passage to the streams.

Is dissipated, never to return.

Trees covering 100 superficial feet of surface, evaporates 6 cubic feet of water every warm and dry day.

18. That trees do exercise considerable influence on the rainfall is undoubted, as, by offering a large evaporating surface, they increase the cold stratum of air which causes condensation. In this way they aid more effectually to wring the clouds of moisture in their passage over the Neilgherries. Hence, it is evident that the more abundant the trees on the Neilgherries, the more effectually is the Coimbatore district deprived of the western rains.

19. Evaporation is, in fact, the principal cooling agent on the globe, being always in proportion to the amount of exposed surface. Suppose, for example, a tree of 45 feet in height, covering 100 square feet of the surface of the ground, this tree will, at the lowest calculation, present an evaporating surface of at least 8,000 square feet, as evaporation goes on from every leaf and green shoot, and unless under very dense shade, the evaporation and radiation from the 100 square feet of ground it covers would not be entirely destroyed; thus a tree increases 80 times the evaporating surface, and would perspire from two to three times the amount of water that would be evaporated from the ground were the tree felled, as the average evaporation from the surface of a leaf is only $\frac{1}{5}$ th part of that from a similar surface of moist ground, and $\frac{1}{40}$ th from the same surface of water, all being under the same relative conditions. However, as the air becomes charged with moisture, evaporation from the surface of the leaves becomes less active, and ceases entirely at saturation, when another function directly the reverse commences; the leaves now beginning to imbibe moisture.

20. From the above point of view it is obvious that trees exercise considerable influence on the rainfall and deposit of dew. But there exists another and counterbalancing effect too frequently overlooked, which makes trees in a climate like ours a far greater drain on the moisture than they prove a source of supply. It has been shown that trees, by expending moisture (evaporation) convey to the air the power (cold) of condensing moisture; hence, it becomes an object of inquiry to ascertain how far the waste exceeds the supply gained by this process, especially on these hills where we have about three months of continuous clear weather, and dry atmosphere, with a difference of from 8° to 13° Fahrenheit between the wet and dry bulb thermometers. Here large extents of evaporating foliage throw off daily an enormous quantity* of moisture, drawn from a depth of the soil so far as the roots penetrate; this moisture, which would otherwise have supplied the springs, is thrown off by the leaves into the dry and arid atmosphere, where it is dissipated and driven by currents of air into higher latitudes.

21. A tree, 45 feet high, and covering 100 superficial feet, throws off at least six cubic feet of water every warm and dry day. An acre would contain 433 of such trees; but, reduce this number to 300, and

* "Vegetable Statistics" by Dr. Hales, quoted in Lindley's "Introduction to Botany," Volume II., pp. 288, 289, 291.

"July 3rd, 1824.—In order to find out the quantity imbibed and perspired by the sunflower, I took a garden pot with a large sunflower, 3½ feet high, which was purposely planted in it when young. I covered the pot with a plate of thin milled lead, and cemented all the joints fast, so as no vapour could pass, but only air, through a small glass tube nine inches long, which was fixed purposely near the stem of the plant, to make a free communication with the outward air, and that under the leaden plate. I cemented also another short glass tube into the plate, two inches long and one inch in diameter. Through this tube I watered the plant and then stopped it up with a cork; I stopped up also the holes at the bottom of the pot with corks. I found the greatest perspiration of twelve hours in a very warm dry day to be one pound fourteen ounces, the middle rate of perspiration one pound four ounces. The perspiration of a dry warm night without any sensible dew was about three ounces."

"From July 3rd to August 3rd, I weighed, for nine several mornings and evenings, a middle size cabbage plant, which grew in a garden pot, and was prepared with a leaden cover as the sunflower. Its greatest perspiration in twelve hours was one pound nine ounces, its middle perspiration one pound three ounces, 32 cubic inches."

and it gives a daily evaporation, from every acre of forest, of 1,800 cubic feet, or the enormous quantity of upwards of 11,000 gallons; yet, incredible as this may appear, it does not represent one-half the moisture thrown off daily by an acre of forest on the Neilgherries during the months of January, February, and March. In each year the average number of warm and dry days exceeds 190, but reduce this number to 150, and we have upwards of a million and a half gallons of water extracted from the soil and dissipated by every acre of forest. The practical effect of an agency so enormous is very apparent on the springs and streams on the Neilgherries, as all springs arising in, and passing through, valleys destitute of trees, maintain their flow throughout the dry season far better than those which arise in, and pass through, wooded valleys; it being obvious that the roots of the trees intercept and drink up the water in its descent through the soil to the streams. Many extraordinary convincing proofs of this potent agency are to be met with on the Neilgherries; and I give, as an example, the spring that supplies the Botanical Gardens here, which has its rise in the valley partially cleared of forest two years ago for the first Dodabetta plantation, the flow of water in the stream during the last excessively dry season was fully twice as much as prior to the forest being felled.

In 150 clear and dry days in the year upwards of a million and a half gallons of water dissipated by every acre of forest.

Practical effect apparent on the streams and springs.

Streams arising in, and flowing through, valleys destitute of trees, maintain their flow much better than springs arising in and passing through wooded valleys.

Many convincing examples to be met with on the hills.

An example in the stream which supplies the Government gardens.

22. The foregoing favours the opinion that if the Neilgherries were destitute of forest, the streams in the dry season would carry to the low country a flow of water twice as much as they do at present. But the great advantages which trees bestow cannot be overlooked; they improve the soil on which they grow, render the temperature more equable, reduce the violence of storms, afford shelter and shade very grateful to man, and their presence gives a pleasing effect to the eye, while their gaseous emanations are highly beneficial to animal life. These advantages, apart from their conomical uses, require (so far as is consistent with general cultivation) the presence of trees in every locality where they can be produced.

Neilgherries destitute of trees, twice as much water would flow to the low country during the dry season.

Advantages of trees.

23. In the above observations the important fact has not been taken into consideration, that the trees forming the natural forests on the plateau and upper slopes of the Neilgherries are quite useless except for firewood, and that planting chinchonas would be substituting valuable for worthless trees. My object in introducing this subject is to show the reservation of the natural forests to be unnecessary so far as they affect the local rainfall and that of the Coimbatore District.

Object of foregoing remarks.

To show the reservation of natural forests, fails to increase rainfall.

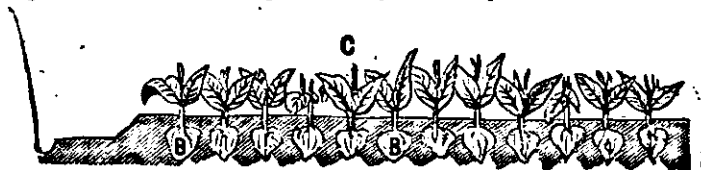
24. The treatment described in previous reports and "Notes on Cultivation, 6th March 1863," has been found generally adapted to the requirements of the plants, especially as regards their propagation. In transplanting from the propagating houses into the nurseries, a modification has been found necessary. In order to enable the plants to be removed without damage to their roots, a layer of moss is introduced under each line of plants. A represents a transverse section of the nursery bed, with moss B introduced, C being the longitudinal section. The manner in which the plants are planted being the same as described in paragraph 26, it being essential to success not to catch the roots of the plants in the hand, as the least bruise destroys them, therefore the plants should invariably be lifted by the leaves.

Cultivation; modification of former treatment.

Transplanting plants in nurseries.

Roots must not be handled.

NURSERY BEDS.
Longitudinal Section, showing the ends of the lines of moss under the soil.



Transverse Section, showing the lines of moss.



Permanently in the plantations.

Removing plants from nurseries to plantation.

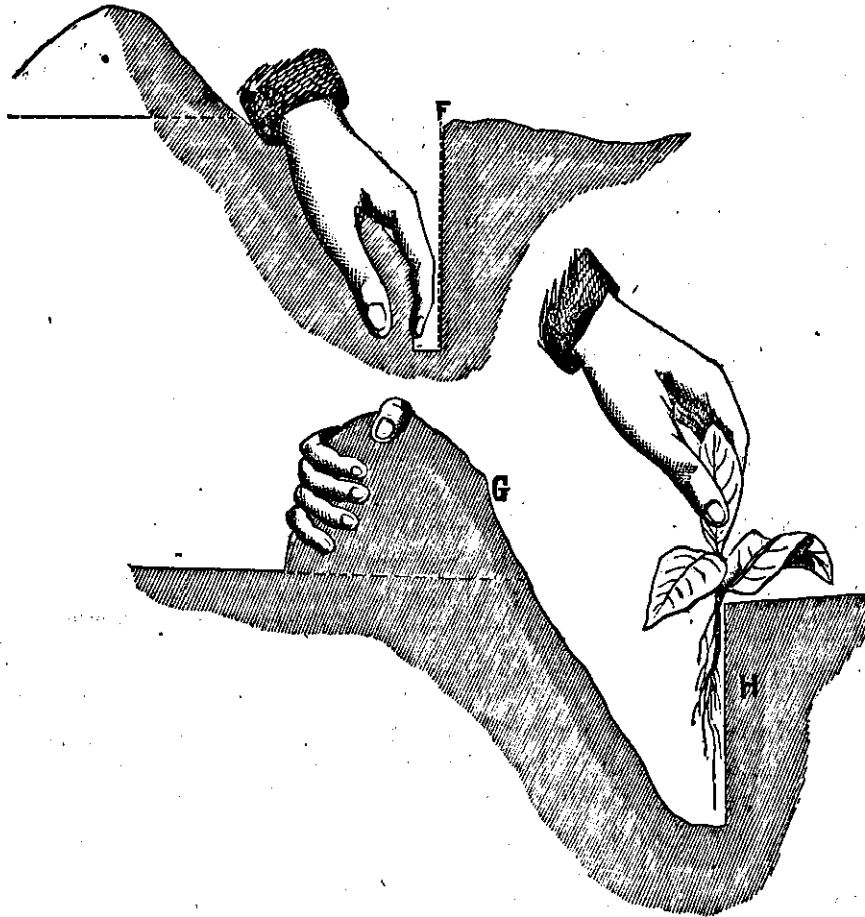
25. In permanently planting out, the distance apart has been reduced from 10 and 12 feet to 6 and 7, and a modification of our former method of planting has also been found necessary. In order to facilitate this operation, the plants when removed from the nurseries, beds, or pots, are laid in a deal box in nearly a horizontal position between thin layers of moss, beginning to fill the box at D, and finishing at E; in this way from 1,000 to 2,000 plants are placed in each box, and carried by one or two men from the nursery ground to the planters, where the box is placed in the centre of the line between the planters in order that it may be conveniently moved along as the operation proceeds. The planters remove the plants one at a time beginning at E, and continue this operation until the box is emptied.

Section of box for conveyance of plants from nurseries to plantations, the covering being raised about 2 inches on cross bars to allow a free circulation of air over the tops of the plants, while it shelters them from the sun.



Manner in which they are planted.

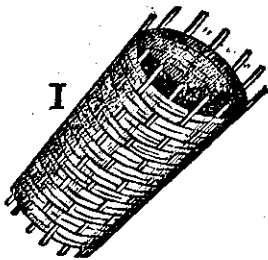
26. Each plant is lifted from the box by catching the leaves between the forefinger and thumb of the left hand, while with the right hand the roots are freed from any obstruction; it is then carried to the spot where intended to be planted, the right hand being thrust into the soft prepared soil in a sloping direction, and gently raising the back of the hand to the dotted line shown at F; the earth is then drawn forward as at G, leaving a straight bank behind the hand at H; the plant is now placed by the left hand against the face of the bank, the collar or top of the root being held on a level with the ground; the roots are now spread out with the right hand and the hole deepened, should the length of the roots require it; the earth from G is then brought forward with the right hand against the roots, but not pressed, and thus the operation of planting is completed; in this way a man can plant from 400 to 500 plants daily.



And shaded.

Method of shading plants.

27. The young plants immediately after being planted (instead of being sheltered as formerly by a screen made of bamboo branches) are covered by a cylindrical basket open at both ends, 12 inches in diameter, and 14 inches long as at I, made out of the common wattles so plentiful on these hills, one man making from 8 to 10 of such baskets daily; this is found the most efficient as well as the most economical way of protecting the plants, as when they are established the baskets can be removed and are available for further use.



Usual mode of staking the plants proves to be injurious by the ties cutting into the bark.

28. It has been found that the plants when staked in the usual way are injured by the tie cutting into the bark; to remedy this, one or two

two stakes are placed on opposite sides at a distance of about 12 inches from the plant, and a hoop formed of rattan covered with moss for large, or willow twigs for small, plants is placed around the branches and tied to the stakes at both ends, when two are used as at J. In stormy situations, and steep lands, it would appear desirable, instead of staking, to secure the plants to the ground by bending them forward and pegging them against the face of the hill; the plants would then throw up numerous shoots, and these shoots would protect each other from the force of the wind.



Adopted method of staking, by which the cutting is avoided.

29. Cultivation under living trees has been entirely abandoned, the plants having been found to suffer from the effects of the drip and want of light, while the roots of the trees in the neighbourhood penetrate the holes and draw up all the nourishment from the young plants; they are also liable to damage from the branches as well as the trees being broken and falling during storms.

Cultivation under shade of living trees, and in the open ground.

30. Partially cleared forests have also been found quite unsuited to give shelter, as the high gales of wind being caught by the tops of the trees are driven down in strong eddies, as the current from the top of one tree meets that from another, and thus twists the plants in all directions, producing much greater injury than a steady gale. In short, the more exposed the situation in which the plants are growing the more healthy and robust they appear, although they do not attain so rapid growth as in more sheltered localities, thus establishing, beyond all doubt, that the more the plant is exposed to light and air, the more perfectly it performs its functions; thus the juices being more effectually elaborated, we may expect a large proportion of alkaloid, which may counterbalance the comparative slower growth.

Partially cleared forests quite unsuited to the cultivation of the plants.

Plants fully exposed to light and air more perfectly perform their functions.

31. The large-leaved species of chinchona (red and grey barks) suffer considerably from high winds, especially when young; the leaves are frequently blown to pieces, and occasionally in very exposed situations the branches are broken, and the plants twisted out of the ground. As the plants grow older their leaves become smaller, and consequently not so much affected by the wind; the yellow and crown barks do not suffer so much from storms, their leaves being much smaller; they are, however, occasionally injured in heavy gales. The storms of hail so frequent here in March and April, although productive of temporary damage by cutting the leaves, yet the plants have not materially suffered from this cause.

Effect of storms and wet and dry weather on cultivation. Plants suffer from, when young.

As attain age, less liable to injury.

Hail storms break the leaves, but do no permanent damage.

32. During continuous wet weather, the leaves assume a yellow tint, and become contracted around the margin towards the under surface, causing rough undulations in the texture of the leaf along the midrib and between the lateral veins. It also induces a succulent and unhealthy condition of the plant, in some instances causing an unnatural development of pith, rendering the plant liable to disease, 25 plants having died from the effects of the continued rain of last season. The grey barks suffer most from the constant stream of water thrown down their channelled leaf stalks, communicating rot to the bark, which occasionally penetrates to the stem, and thus permanently injures the plant. The heavy rains have been found to carry down a large quantity of earth, which covered the plants and caused much time to be occupied in its removal; this has been effectually obviated by a system of surface drains.

Continuous wet weather, effects of.

33. As observed by early writers, "the condition of showers and sunshine" has proved most favourable for the growth and full development

Showers, alternated with sunshine, prove most favourable to the growth of plants.

Bear considerable drought without injury.

Ninety-eight days of continuous drought necessary to hand-water young plants.

Gathering the bark, and treatment of plants for this purpose.

Removing bark in strips injures growth of plants.

"Red," "grey," and "yellow" barks throw out shoots from the stools when cut down between March and August.

But not when cut between September and February.

"Crown" barks an exception, as they throw shoots at any season.

If cut during dry weather, plants must be prepared.

Lopping and pruning adopted, species readily produce fresh branches.

Chinchona Pitayensis, attempt to introduce.

ment of the chinchona under cultivation. The plants, however, when established, bear a considerable amount of drought without injury. During the first two months of last severe dry season the plants maintained their growth and healthy appearance, the drought then began to make itself felt, the leaves of the plants assuming by degrees the contracted form and yellow tint, as during the continuous rains. After three months continuous drought a few of the plants on the more exposed parts of the plantation began to droop; in a few days this tendency increased, and on the 98th day it became necessary to water the plants by the hand. These were plants of one year's growth, and probably plants of two years' growth in good soil would bear greater drought without injury.

34. In collecting our samples of bark, lopping the branches or cutting down the plants to within a few inches of the ground has been found the most advantageous. Removing the bark in strips from the stems of the plants has been discontinued, for although new bark is formed over the spaces, it is not until more or less decay has been communicated to the wood, and thus the stems are prevented from expanding.

35. The plants of "red," "grey," and "yellow" barks, cut down between March and August, have uniformly thrown strong shoots from the stools; these shoots have grown with great vigour, and this may be found a profitable way of treating the plants, particularly in exposed situations, as the number of shoots thrown from the stools afford mutual protection.

36. It is, however, important to note that of the plants cut down between September and February (although of the same species) not one in five threw shoots from the stools; of these plants two retained life for a few days, then gradually died away. The varieties of "crown" barks, however, form an exception, as these possess sufficient vitality to produce strong shoots at whatever season of the year they are cut.

37. From the above it is obvious that if the harvest of bark is to be obtained by cutting down the plants in the dry season, or between December and March, they must be prepared during the preceding wet weather, as described and illustrated at paragraph 21, plate VI. in "Notes on Cultivation, &c., dated March 1863."

38. When the system of lopping and pruning is adopted, all the species are found readily to produce fresh branches at any season of the year.

39. On the 4th of April 1864 I received from Mr. Markham, a small packet of seeds of *C. Pitayensis*, these were sown on the same day; a large packet received on the 20th idem, through the Government, were also sown on their receipt, and I regret to add that, up to the present date, not one seed has germinated, and fear there is now no hope of their doing so. This is much to be regretted, as the species is one of great value; and although we possess the *C. lancifolia* from Java, a Pitayo bark, yet, there being three varieties, the *lancifolia* may not be the most valuable kind; it is therefore desirable that another attempt should be made to procure fresh seeds of these plants.

40. Mr. Cross* collected the seeds in July and August 1863, and conveyed

* EXTRACTS from Mr. Cross's Letters:—

Bogota, 16 September 1863.

"There are three varieties of Pitayo Chinchona, white, yellow, and red, of which the latter is by far the finest and most valuable, having actually, in several instances, yielded 5 per cent. of sulphate of quinine. It rarely falls below 3 per cent., but its

conveyed them to Bogota, with the intention of forwarding them to Mr. Markham. By some mistake the sum which Mr. Cross was to have received for collecting the seeds had not reached Her Majesty's consul; this gave offence, and Mr. Cross returned, carrying the seeds with him into the interior of the country. After a delay of five months, and in compliance with the entreaties of Mr. Markham, the seeds were ultimately despatched, apparently after having lost their germinating powers.

41. The difficulties previously experienced in procuring efficient men has been severely felt this year, in consequence of the number of coffee and tea plantations lately opened in the neighbourhood (no less than 36 having been commenced within the last 18 months); many of our best men have left either to open plantations for themselves, or to fill situations where greater inducements are offered. Mr. Batcock, the deputy superintendent, has given great satisfaction in carrying out the work entrusted to his charge. Lieutenant Nichol recently placed in the charge of the Neddivuttum plantations, has shown energy and activity in pushing forward the operations. I have also reason to be satisfied with the diligence and care shown by Mr. Smith, assistant superintendent of the Dodabetta plantation. Overseers Burrows, Ramsey, and Wilkinson have been attentive and careful in conducting the work. In the office establishment Narrainsawmy Naidoo and Mr. McNair have given every satisfaction in the performance of their duties as pay clerk and accountant.

Establishments.

42. A range of hardening pits has been added to our propagating departments, which affords shelter for 75,000 plants, and these, with the five propagating houses described in previous reports, give ample appliances for the production of between 20,000 and 30,000 plants monthly. The total number of plants produced up to 31st May 1864 being 416,909; of this number 31,662 have been distributed to the public. Extensive nurseries have been formed on the different plantations for the accommodation of the plants produced during the current year, in all, sufficient to contain 350,000.

Progress of operations.

Propagation and nurseries.

416,909 plants propagated.

31,662 plants distributed to the public.

Nurseries formed for 350,000 young plants.

43. On the Neddivuttum plantations it has been found necessary to renew several of the temporary buildings for the coolies; the wood covering the drains and culverts formed in 1862 have been renewed and replaced by stones; the surface drains on the Denison plantations widened and increased in number, in order to prevent the severe wash occasioned by the heavy rain of last monsoon; there 220 acres are already

Neddivuttum plantations.

220 acres planted; roads, drains, &c. finished.

general yield is 3½ to 4. This variety has been much sought for, and at the time I write it scarcely exists. It is dug up, roots and all, whenever found. After searching through mountains, ravines, and wild broken ground near Popayan, I found a splendid clump owned by an Indian, and made a clean sweep of all the seeds that were on the trees. On returning to my encampment I carefully dried the precious collection. I say precious, for neither I nor any one else can ever make a similar collection again, simply because the species will very soon be entirely annihilated. The Indian was about to dig up the roots of the clump, and when this is done the valuable species will be lost for ever. I have seen plants of this variety dug up in the surrounding forests whose stems were not thicker than a writing quill, but these are rarely to be met with, for the plant, as already stated, is nearly exterminated. On drying the collection I found I had secured nearly a million and a half, a million of which I considered to be the finest seeds I had yet collected in the Andes."

20th January 1864. "I believe the seeds to be as fresh for purposes of germination as the day they were collected on the Pitayo mountains. I send a few seeds in this letter, because I find I will not be able to get down in time for the steamer. The rest will certainly come by the following mail. The seeds were well ripened, carefully dried, and have been carefully protected up to the present time. Give the seeds on the Nilgherries about the same temperature as the Loxa seeds until they germinate. Then treat them as hardy as possible. Care must be taken that this species does not get overloaded at the roots with moisture. It is the most rapid growing of all the Chinchonas, and perhaps the best."

(signed) Clements R. Markham.

205 additional acres cleared, and in a forward state of preparation for planting.

already planted; roads, drains, trenches, &c., finished; on the first Denison plantation the plants have attained considerable size, and promise to rise rapidly into a luxuriant forest. On the Markham plantation the plants have only recently been planted, and are necessarily small; 205 additional acres have also been cleared, and are in a forward state of preparation for planting; the earthwork of the roads and bridges completed, though here and there interrupted by rocks, which are being removed; the propagating house on this plantation has been extended, and affords sufficient space for 20,000 cuttings.

Wood plantation at Pykara works made less progress.

165 acres more or less prepared. 8 acres only planted.

44. On the Wood plantation at Pykara the work has not made such satisfactory progress, owing to the difficulty in obtaining an efficient assistant. Here, however, 165 acres of land have been more or less prepared, of which eight acres only have been planted. The permanent buildings finished, and comfortable lines for coolies erected.

Dodabetta plantations, 95 acres planted.

And commenced on 60 additional acres.

Total extent of 500 acres enclosed by a trench.

45. On the Dodabetta plantations the work has progressed satisfactorily, 95 acres being planted, and 60 additional acres in progress; here upwards of 500 acres have been inclosed with a trench, and 11,000 yards of road cut intersecting this extent of land, the object in cutting these roads prior to planting being to facilitate the removal of the firewood, and thus increase its market value. The wood has realised 5,050 rupees, and paid to the credit of the Forest Department.

New plantation on Koondahs.

160 acres felled.

75 lopped and burned.

Temporary buildings finished.

46. In opening the new plantation on the Koondahs, great difficulty has been experienced in pushing forward the operations, owing to the want of roads; here 160 acres have been felled, of this 75 acres have been lopped and burned, and is at present in course of preparation for planting; coolie lines and other temporary buildings have been completed, and a contract entered into for making the road, I therefore trust shortly to be able to procure sufficient labour to complete the permanent buildings.

Botanical Gardens.

Improvements effected.

47. In the Botanical Gardens the prevailing scarcity of labour has been much felt, especially towards the end of the year, notwithstanding considerable improvement has lately been effected. Between the upper and lower gardens an ornamental piece of water has been formed, enclosed by a revetment wall raised so as to form a parapet to the adjoining terrace; this terrace is in the form of a crescent, and is now being laid out into parterre, with a band-stand in the centre, and three fountains on each side. In the upper portion of the garden three fountains have been erected, and are working well; here also parterres and ornamental vases have been introduced, and the whole made as attractive as possible by planting with choicest flowers and shrubs. In the lower garden a labyrinth has been formed on the plan of that at Hampton Court, the hedges of Rose floire de Rosamere and Blairü; here also an ornamental piece of water has been added; in this portion of the garden the plants suffer much from the attacks of the grubs of the cockchafee, rendering it difficult to secure that luxuriance of vegetation which prevails in the upper garden.

Plants introduced.

48. During the year many valuable plants have been added to our collection. To his Excellency Sir William Denison, Governor of Madras, we are indebted for the very valuable *Araucarias Bidnellii* and *Cookii*, the beautiful *Clianthus Dampierii*, twelve varieties of Australian grapes, and numerous seeds of valuable timber trees, as *encalypti*, *acacias*, &c., and to Mr. Lascelles for the *Cupressus Macrocarpa*, *Dammara Brownii*, and a few species of unnamed Japan conifera. From Dr. Anderson, of the Calcutta Botanical Gardens, *Podocarpus longifolia*; to Messrs. E. B. Thomas and E. Thomas, for a collection of European fruit trees and shrubs; to Mr. J. D. Sim, for *Amherstia Nobilis*, *Stigmaphyllon Ciliatum*, *Meyenia erecta*, and the white variety of

OF THE CHINCHONA PLANT INTO INDIA. 111

of *Lagestria indica*; to Major Hutton, for four fine varieties of fuchsia and a few British forest trees; to Mrs. Arbuthnot, for numerous ornamental plants, and to Dr. Birdwood, of Bombay, for *Strelitzia Angustifolia*.

The following Table exhibits the distribution of garden plants, seeds, &c. for 1863-64:

Months.	Fruit Trees and Shrubs.	Timber Trees.	Shrubs and Flowers.	Collections of Seeds.	Amount.
					<i>Rs. a. p.</i>
1863.					
May - - - -	- -	74	- -	19	186 4 -
June - - - -	53	10	88	17	189 - -
July - - - -	77	56	138	23	248 1 -
August - - -	86	33	58	33	246 1 6
September -	44	47	134	34	217 15 6
October - - -	168	5	250	15	388 3 6
November - -	6	22	202	17	188 4 -
December - -	- -	122	165	12	117 - -
1864.					
January - - -	- -	- -	- -	1	1 14 -
February - -	- -	- -	3	2	3 10 -
March - - - -	- -	- -	9	11	45 14 -
April - - - -	50	245	348	2	152 2 -
TOTAL Distribution -	484	614	1,340	186	1,784 5 6

49. From the above observations it will be observed that during the past official year we have made great progress, still the scarcity of labour has been severely felt, rendering it difficult to perform the different operations at the proper seasons. In conclusion, I beg to tender my grateful acknowledgments to his Excellency Sir William Denison, Governor of Madras, for the liberality with which he has met every suggestion tending to facilitate the progress of this important undertaking. To Mr. Markham, of the India Office, my best thanks are due for much valuable assistance, and the deep interest he has evinced in the progress of the Chinchona plantations; also to Mr. Howard, for the very important information he has so liberally furnished on the formation of alkaloid in the bark.

(signed) *G. W. McIvor,*
Supt. Govt. Chinchona Plantations.

Ootacamund, 7 July 1864.

(A.)—ESTIMATED COST of each CHINCHONA PLANTATION, from Commencement of Operations to 30 April 1864.

PARTICULARS.	Operations preparatory to Receipt of Plants.	Superintendent and Writer Establishment.			Nursery Department.			Dodabetta Plantations.			Neddivuttum Plantations.			Pykara Plantations.		Malah Koondah Plantations.	For the Plantations of 1864-65.	TOTAL.
	1860-61.	1861-62.	1862-63.	1863-64.	1861-62.	1862-63.	1863-64.	1861-62.	1862-63.	1863-64.	1861-62.	1862-63.	1863-64.	1862-63.	1863-64.	1863-64.	1864-65.	
Grant for the preparation of sites	Rs. 2,000																	Rs. 2,000
Establishments		4,200	5,350	5,880	3,324	4,305	4,609	2,280	5,400	5,700	5,064	8,412	15,348		4,033			73,905
Buildings					1,200			560			2,080			1,530			4,000	18,445
Tool and store rooms					2,000				250		250			250		125		
Coolies' quarters								200	500		1,000	1,000		1,000		500		2,250
Felling								400	1,500		1,500	3,000		1,500		6,150		
Clearing								260	1,500		1,500	3,000		1,500				48,930
Pitting								400	1,500		2,000	3,000						
Carriage of plants								150			450	450						11,631
Planting and shading								200	500		550	550			1,300			
Trenching								1,800			4,000				8,000			5,570
Enclosing					756				5,850		3,900				750	375		
Road making									2,025		1,520				1,350	675		4,405
Tools									1,200		1,282				1,282	641		8,521
Contingencies					196			399	1,200		2,003	1,831			2,046	846		
TOTAL	Rs. 2,000	4,200	5,350	5,880	7,476	4,305	4,609	6,669	21,425	5,700	27,099	21,243	15,348	7,780	18,761	9,312	6,250	1,73,407

Ootacamund, 7th July 1864.

W. G. McIvor, Superintendent, Government Chinchona Plantations.

(A.)—ACTUAL EXPENDITURE on each CHINCHONA PLANTATION, from Commencement of Operations to 30 April 1864.

PARTICULARS.	Operations preparatory to Receipt of Plants.	Superintendent and Office Establishment.			Propagation and Nursery Departments.			Dodabetta Plantations.			Neddivuttum Plantations.			Pykara Plantations.		Malah Koondah Plantations.	TOTAL.
	1860-61.	1861-62.	1862-63.	1863-64.	1861-62.	1862-63.	1863-64.	1861-62.	1862-63.	1863-64.	1861-62.	1862-63.	1863-64.	1862-63.	1863-64.	1863-64.	
Establishment	Rs. a. p. 114 2 3	4,347	5,343	6,437	2,024 11 6	3,329	3,440	1,481	2,274	2,605	2,910	6,195	5,874	1,608			Rs. a. p. 47,981 13 9
Buildings					2,647	3,578	3,000	865			1,560		1,000	1,683		350	21,188
Tool and store rooms									230			550	500	275			
Coolies' quarters									200	500		1,750	1,000	1,100	550		2,400
Felling	302 5 3							448	750	500	1,730 7 3	1,500	2,200	1,500	2,000	1,125	
Clearing								400	750	400		1,500	2,200	1,125	2,000	1,125	42,687 7 2
Pitting								848	750	1,010	1,680 7 3	868	2,000		1,000		
Carriage of plants								245	200	140	540 1 9	900	750		65		679
Planting and shading								355	450	560	640 1 8	900	898		65		
Trenching										1,200		1,972	1,780				900
Enclosing									2,800			1,550	900		679		
Road making	300							600	700	2,070	1,100	1,000	2,000		1,500	502	9,772
Tools	271							394	304	600	700	400	860		1,500		5,029
Contingencies	67							124	460	500	340	915	850		400	100	3,756
TOTAL	Rs. 1,054 7 6	4,347	5,343	6,437	4,671 11 6	6,907	6,440	5,760	9,688	10,315	11,351 1 11	19,790	22,812	5,683	11,367	4,477	1,36,343 4 11

W. G. McIvor, Superintendent, Government Chinchona Plantations.

(B.)--METEOROLOGICAL OBSERVATIONS from 1st May 1863 to 30th April 1864, made on the Government Chinchona Plantation at Nedddivuttum.

MONTH.	Mean Monthly Temperature.	Mean Daily Range.	Maximum observed during the Month.	Rainfall.	Days without Rain.	Days with Rain.
1863 :						
July - - -	62.5	12.6	76.0	<i>Inches.</i> 15.46	5	25
August - - -	64.6	16.3	74.0	23.77	9	22
September - - -	66.5	15.6	80.0	5.59	9	21
October - - -	66.0	17.3	82.0	10.47	14	17
November - - -	70.0	23.0	89.0	0.50	26	4
December - - -	80.4	27.0	92.0	1.95	26	5
1864 :						
January - - -	65.7	28.0	85.0	0.52	30	1
February - - -	69.8	28.0	87.0	-	29	-
March - - -	72.1	29.4	90.0	0.38	29	2
April - - -	71.4	22.5	99.0	2.80½	18	12
ANNUAL - - -	68.8	21.9	84.5	61.44½	196	110

The readings in this Table are high, in consequence of the sun occasionally striking on the board upon which the thermometers were placed.

Ootacamund, 7 July 1864.

(signed) *W. G. McIvor,*
Superintendent, Government Chinchona Plantations.

(C.)--METEOROLOGICAL OBSERVATIONS from 1st May 1863 to 30th April 1864, made at the Government Gardens, Ootacamund.

MONTH.	Monthly Mean of Dry Bulb Thermometer.	Monthly Mean of Wet Bulb Thermometer.	Due Point of Monthly Means.	Maximum observed during the Month.	Greatest Daily Range.	Rainfall.	Days without Rain.	Days with Rain.
1863 :								
May - - -	62.5	60.8	59	78	23	<i>Inches.</i> 5.98	13	18
June - - -	58.7	58.0	58	73	18	3.99	14	16
July - - -	67.8	56.7	56	72	19	1.49	16	15
August - - -	59.1	58.5	56	71	17	3.58	16	15
September - - -	58.9	57.6	56	72	24	2.16	14	16
October - - -	58.1	* 57.1	56	72	23	8.45	14	17*
November - - -	56.4	54.8	53	70	22	1.86	22	8
December - - -	56.3	53.2	51	71	26	2.38	24	7
1864 :								
January - - -	55.0	51.0	47	73	31	-	31	-
February - - -	58.0	52.0	48	76	28	-	29	-
March - - -	62.0	55.0	50	80	30	0.8	30	1
April - - -	69.0	57.0	56	77	26	8.18	13	17
ANNUAL - - -	Mean, 58.5	Mean, 55.8	Mean, 53.8	Mean, 73.7	Mean, 23.8	Total, 38.17	Total, 236	Total, 130

South-west monsoon commenced on the 31st of May 1863.

* On the 26th October 1863, and two following days, rain most excessive, and gauge overflowed. A calculation from a quarter of an hour's reading on the morning of the 30th, gave 4 inches, 56 cents. as the rain of the preceding night, which was probably below the correct amount. This amount is omitted in the monthly total.

Ootacamund, 7 July 1864.

(signed) *W. G. McIvor,*
Superintendent, Government Chinchona Plantations.

— No. 42. —

ORDER of the Madras Government, 9 February 1865.

1. The Governor in Council considers the foregoing report of the progress of the Chinchona plantations during the official year 1863-64, to be extremely satisfactory. The season was an unusually trying one, the drought being so long continued that it became necessary to resort to watering by the hand, yet the plants made good progress.

2. The propagation has been more successful than in previous years, the monthly average having been 15,326 plants, and the maximum, in February 1864, 32,408. The total number of plants produced up to the 31st May 1864 has been 416,909, of which 31,662 have been distributed to the public.

3. The extent actually planted out in the different Government plantations is stated to be 323 acres.

4. The first plants were permanently planted out at Neddivuttum in August 1862, and have, in the 20 months which have since elapsed, "attained heights varying from six to nine feet, with thick stems, well furnished with lateral branches, and presenting as robust and healthy an appearance as could be wished." This growth is said to be about three inches in excess of the average of the same species (*C. succirubra*) throughout the plantations.

5. The result of the year's analysis of the bark is also highly encouraging, the yield of rough alkaloids having been six per cent., while in the previous year it was only 4.3.

6. There can no longer be room for doubt as to the successful introduction of the Chinchona on the Neilgherries, and the extraordinary success which has attended its culture, whether regard be had to extensive propagation, rapid and healthy growth, or the rich production of alkaloids.

7. For these results the Government are indebted to Mr. M'Ivor, whose able and zealous exertions in this important enterprise merit the highest

8. The total expenditure up to the 30th April 1864 has amounted to 1,36,343 rupees, under the following heads :—

	<i>Rs.</i>
Buildings - - - - -	21,188
Plantations - - - - -	58,388
Tools - - - - -	5,029
Establishment - - - - -	47,982
Contingencies - - - - -	3,756

9. The progress of the different plantations appears to be as follows :—

At Neddivuttum 220 acres have been planted out, with roads, drains, &c., completed; 205 acres are in a forward state of preparation for planting, and the earth-work of the roads and bridges completed. The propagating house has been extended, and afford space for 20,000 cuttings.

At Pykara eight acres have been planted out, and 165 more or less prepared; the permanent buildings and cooly lines have been finished.

At Dodabetta 95 acres have been planted; 60 acres are in progress; 500 acres have been enclosed with a trench, and 11,000 yards of road cut.

At the Koondahs (sanctioned only in December 1863) 75 acres have been lopped and burned, and are in course of preparation for planting; 85 acres have been felled, and cooly lines and temporary buildings erected.

A range of hardening pits, affording shelter for 75,000 plants, has been added to the propagating houses, and there are thus ample means for producing from
20,000

20,000 to 30,000 plants monthly. Extensive nurseries have also been formed on the different plantations.

10. This is a very satisfactory state of affairs.

11. The failure of the seeds of *C. Pitayensis* is much to be regretted, and will be brought to the notice of the Home Government, that efforts may be made to procure a further supply.

12. The paragraphs marginally noted contain much valuable information as to the culture, &c., of the Chinchona, and will be separately printed uniformly with the manual to which they will be added.

Paragraphs 9 to 13.
Paragraphs 24 to 28.

13. The Government have already issued orders for the preparation of a list of reserved lands, so that intending planters may have the means of readily ascertaining what lands are and are not available. The impression, which is said to prevail, that no more forest land will be sold, is altogether without foundation; the extreme difficulty of obtaining competent surveyors, and the necessity which the law imposes, of advertising all lots for three months, necessarily cause delay in the transfer of land; but the Government are not aware of applications having been refused, on the plea of the land being reserved, so frequently as to afford ground for the impression stated. The collector will report how many cases of refusal on this account have occurred during the last year. In order to avoid delay, the Government, it may be remarked, now allow lands to be sold prior to actual survey on condition of the boundaries being carefully and permanently marked, and the purchase being subject to adjustment on the survey.

14. The Government do not deem it necessary here to discuss the subject of paragraphs 17 to 23 of Mr. M'Ivor's report. They will merely observe that Mr. M'Ivor's views are not those in general acceptance.

15. Mr. M'Ivor's account of the botanical gardens is highly satisfactory. The Government consider it desirable that he should now prepare for publication a catalogue of the different trees, shrubs, &c. in the gardens.

16. In future reports the progress of the tea plantation and nurseries of Australian trees should be specially noticed. The Government wish attention paid to the latter, and will continue to supply Mr. M'Ivor with seeds from Australia. The plants when grown can be sold to the public at a fair price, and furnished to the forest department for the Government sholas. The commoner kinds of Australian trees, as the *Acacia Melanoxydon*, need not of course be raised by Mr. M'Ivor.

17. The Government note with satisfaction the testimony borne by Mr. M'Ivor to the services of Mr. Batcock, Lieutenant Nichol, Mr. Smith, and overseers Burrows, Ramsay, and Wilkinson, and of his office assistants Narainsawmy Naidoo and Mr. M'Nair.

(True Extract.)

(signed) . A. J. Arbuthnot, Chief Secretary.

— No. 43. —

From the Government of *Madras* to the Secretary of State for India.

Madras, 4 April 1865.

WE have the honour to forward, for your information, the accompanying Tabular Report on the number, condition, &c. of the Chinchona plants on the Neilgherries, on the 28th February 1865.

Enclosure in No. 43.

REPORT on the Number, Distribution, and Condition of Chinchona Plants on the Neilgherries, on the 28th February 1865.

No. of Species.	Botanical Names.	Commercial Names.	Number of Plants.	Value per Lb. of Dry Bark in the London Market.		REMARKS.
				s. d.	s. d.	
1	<i>C. succirubra</i> - -	Red Bark - -	152,964	2 6	to 8 9	The number of plants permanently planted out in the plantations remain the same as last month, namely, 165,351.
2	<i>C. Calisaya</i> - -	Yellow Bark - -	2,651	2 10	to 7 -	
3	<i>C. officinalis</i> , var. <i>Condaminia</i> (<i>C. Uritusinga</i>).	Original Loxa Bark	3,114	2 10	to 7 -	
4	<i>C. officinalis</i> , var. <i>Bonplandiana</i> (<i>C. Chahuarguera</i>).	Select Crown Bark -	348,572	2 10	to 7 -	The increase by propagation is 23,419, being 3,807 plants above the average of the last six months, making the total number of plants at the end of the month, 539,602.
5	<i>C. crespilla</i> - -	Fine Crown Bark -	2,563	2 10	to 6 -	
6	<i>C. lancifolia</i> - -	Pitayo Bark - -	30	1 8	to 2 10	
7	<i>C. nitida</i> - -	Genuine Grey Bark	2,786	1 8	to 2 9	
8	<i>C. Species</i> without name.	Fine Grey Bark -	8,500	1 8	to 2 10	
9	<i>C. micrantha</i> - -	Grey Bark - -	14,608	1 8	to 2 9	
10	<i>C. Peruviana</i> - -	Finest Grey Bark -	3,389	1 8	to 2 10	
11	<i>C. Pahudiana</i> - -	Unknown - -	425	Worthless.		
TOTAL Number of Plants - - -			539,602			

TABLE II.

MEMORANDUM of the Growth of Eleven Plants of *C. succirubra*, planted in the Second Denison Plantation, at Neddivuttum, on the 30th August 1862.

Number of Plants.	Height in Inches when Planted on the 30th August 1862.	Height in Inches on the 31st January 1865.	Height in Inches on the 28th February 1865.	Growth in Inches during February 1865.	By Whom Planted.
1	23	118½	114	½	His Excellency Sir W. Denison. J. W. Breeks, Esq. Dr. Sanderson. J. D. Sim, Esq. Lieutenant McLeod. P. Grant, Esq. Plant cut down for bark.
2	16½	102	102½	½	
3	19	105½	106	½	
4	15	99	99½	½	
5	27	117½	118	½	
6	20	90	91	1	
7	20	108	109	1	
8	18	109½	110	½	
9	20	112	113	1	
10	20	114	114½	½	
11	18	98½	99	½	
12	-	53½	55	1½	

TABLE II. exhibits the growth of 11 plants of *Chinchona succirubra*, planted out by his Excellency the Governor and other gentlemen, at Neddivuttum, on the 30th August 1862. The average growth of these plants during the month, is ½ths of an inch, being ¼nd of an inch below the growth of last month.

One of the two plants cut down on the 20th of March 1863 for the bark, submitted to Mr. Howard for analysis, has made strong shoots of 55 inches in height, giving the growth of 1½ inch during the month.

The 12 plants of *C. officinalis* (a shrubby species), on the Dodabetta plantation, gives an average growth of 1½th inch, or ¼th of an inch under the growth of last month.

The number of plants issued to the public is 500, making the total number of plants distributed 52,857.

TABLE III.

Showing the Height of 12 Plants of *C. officinalis*, planted on the Dodabetta Plantation at Ootacamund on the 30th September 1863.

Number of Plants.	Height in Inches when Planted on the 30th September 1863.	Height in Inches on the 31st January 1865.	Height in Inches on the 28th February 1865.	Growth in Inches during February 1865.	REMARKS.
1	19	70	72	2	
2	14½	61½	64	2½	
3	28	76	76	1	
4	22	78½	79	½	
5	21½	71½	75	3½	
6	28	79	82½	3½	
7	22½	71	73	2	
8	21½	71	72	1	
9	21½	78	80	2	
10	19½	73	73	—	
11	24	76	76	1	
12	24	74	77	3	

TABLE IV.

REGISTER of Chinchona Plants distributed.

NAMES.	STATIONS.	Number of Plants.
Mr. F. N. Maltby	Travancore	16
Dr. Junghuhn	Java	56
Mr. A. R. Lascelles	Ootacamund	12
Mr. M. Anderson	Jamaica	2
Dr. Wiche	Bombay	10
Dr. T. Anderson	Calcutta	554
Dr. Jamieson	Saharanpore	107
Professor Lees	Calcutta	547
Rajah of Travancore	Travancore	621
Major Morgan	Ootacamund	1,534
Mr. E. T. Fitzgerald	Calcutta	558
Mr. J. W. B. Money	ditto	1,869
Dr. W. Bourne	ditto	532
Captain Cox	Wynad	6
Mr. Hollock	ditto	2
Mr. T. Sheffield	Ootacamund	12
Dr. F. Day	Cochin	100
Mr. Brown	Tellicherry	12
Mr. J. Hall	Ootacamund	144
Mr. J. Knop	ditto	18
Captain Lees	Bengal	281
Mr. W. H. Rayne	Manantoddy	424
Rev. — Sawyer	Ootacamund	1,018
Mr. A. Frend	ditto	112
Mr. Hollock	ditto	1
Mr. J. Pierie	Seegoor	12
Colonel Scott	Ootacamund	1,226
Mr. Berend	Cachar	275
Rev. J. Hunter	Coonoor	12
Mr. W. H. Stanes	ditto	1,262
Colonel R. Cooper	ditto	12
Mr. F. Cockburn	Kotagherry	12
Mr. J. Mullaly	Coonoor	24
Colonel Woodfall	ditto	12
Mr. C. Anderson	ditto	24
Colonel Angelo	ditto	12
Rev. E. Laseron	Ootacamund	12
Captain R. N. Taylor	ditto	96
Major W. Agnew	Coorg	139
Mr. V. H. Levinge	Madura	12
Chief Commissioner of	Assam	28
Mr. Fletcher	Nagpore	24
Gool Mahomed	Ootacamund	20

TABLE IV.—Register of Chinchona Plants distributed—*continued*.

NAMES.	STATION.	Number of Plants.	REMARKS.
General M'Cleverty	New Zealand	23	
Mr. W. Robinson	Kotagherry	30	
Mr. Crake	Wynad	12	
Mr. H. R. Dawson	Seegoor	12	
Captain Mann	Coorg	48	
Mr. E. Roberts	ditto	580	
Mr. H. Russell	Wynad	12	
Reverend Wait	Coonoor	2	
Collector of Belgaum	Belgaum	28	
Collector of Honore	Honore	28	
Dr. Ross	ditto	15	
His Excellency the Governor	Bombay	158	
Mr. H. Hinde	Wynad	12	
Mr. E. B. Thomas	Coonoor	12	
Rajah of Poonganoor	Poonganoor	12	
Major Grant	Wellington	226	
Messrs. Thomas Shaw & Co	Poonganoor	28	
Mr. J. H. Trinson	ditto	81	
Dr. Muller	Melbourne	28	
Mr. Tyrrell	Mysore	12	
Dr. Savers	Vellore	12	
Major C. P. Taylor	Ootacamund	5,250	
Doctor Wilson	ditto	6	
Mr. Schnarrie	ditto	15,000	
Captain Fuller	Coonoor	268	
Mr. Drummond	Ootacamund	224	
Captain Jennings	ditto	1,756	
Lieut. H. B. Montmorency	Bangalore	6	
Mr. M'Hutchin	Ootacamund	3	
Colonel Molesworth	ditto	6	
Mr. C. Gray	Coonoor	12	
Mr. H. B. Leddell	Ootacamund	12	
Mr. Minchin	Wynad	1,800	
His Excellency the Governor	Vizagapatam	35	
Mr. R. F. Phillips	Kotagherry	1,117	
Colonel Cooke	ditto	24	
Mr. G. J. Glasson	Wynad	1,000	
Dr. Macpherson	Mercara	400	
Mr. W. H. Kerr	Coorg	8,100	
Mr. James	Ootacamund	1,000	
Colonel Whish	Bengal	82	
Mr. K. Mair	Calcutta	1,180	
Mr. W. Shakespear	ditto	61	
Mr. E. E. Meakin	ditto	168	
Mr. C. Acland	ditto	150	
Mr. K. M'Iver	ditto	124	
Mr. Havelock	Ootacamund	12	
Mr. H. de Facien	Kartairy	6,821	
Major Sweet	ditto	102	
Captain Campbell	Bangalore	6	
Royal Gardens	Mauritius	36	
Honourable W. R. Arbuthnot	Wynad	98	
Mr. H. Maxwell	Bombay	50	
Mrs. C. Smith	Wynad	22	
Captain Beckley	Wellington	200	
Mr. A. Frend	Ootacamund	400	
Mr. Walsh	Salem	100	
TOTAL Number of Plants		52,857	

Ootacamund,
15 March 1865.

(signed) *W. G. M'Ivor*,
Superintendent, Government Chinchona Plantations.

— No. 44. —

From the Government of Madras to the Secretary of State for India.

Madras, 13 April 1865.

We have the honour to forward for your information the accompanying Tabular Report on the number, condition, &c. of the Chinchona plants on the Neilgherries on the 31st March 1865.

Enclosure in No. 44.

REPORT on the Number, Distribution, and Condition of Chinchona Plants on the Neilgherries, on the 31st March 1865.

No. of Species.	Botanical Names.	Commercial Names.	Number of Plants.	Value per Lb. of Dry Bark in the London Market.		REMARKS.
				s. d.	s. d.	
1	<i>C. succirubra</i> - -	Red Bark - - -	161,278	2 6	to 8 9	<p>The number of plants permanently planted out in the plantations remain the same as last month, namely, 165,351.</p> <p>The increase by propagation is 16,900, being 3,544 plants under the average of the last six months, making the total number of plants at the end of the month 555,922.</p>
2	<i>C. Calisaya</i> - -	Yellow Bark - - -	2,711	2 10	to 7 -	
3	<i>C. officinalis</i> var. <i>Condaminea</i> (<i>C. Uritus-singa</i>).	Original Loxa Bark -	3,488	2 10	to 7 -	
4	<i>C. officinalis</i> var. <i>Bonplandiana</i> (<i>C. Chahuarguera</i>).	Select Crown Bark -	356,072	2 10	to 7 -	
5	<i>C. crespilla</i> - - -	Fine Crown Bark - -	2,579	2 10	to 6 -	
6	<i>C. lancifolia</i> - -	Pitayo Bark - - -	98	1 8	to 2 10	
7	<i>C. nitida</i> - - -	Genuine Grey Bark -	2,786	1 8	to 2 9	
8	<i>C. Species</i> without name.	Fine Grey Bark - -	8,500	1 8	to 2 10	
9	<i>C. micrantha</i> - - -	Grey Bark - - -	14,666	1 8	to 2 9	
10	<i>C. Peruviana</i> - - -	Finest Grey Bark - -	3,389	1 8	to 2 10	
11	<i>C. Pahudiana</i> - - -	Unknown - - -	426	Worthless.		
TOTAL Number of Plants - - -			555,922			

TABLE II.

MEMORANDUM of the Growth of Eleven Plants of *C. succirubra*, planted on the Second Denison Plantation, at Nedddivuttam, on the 30th August 1862.

Number of Plants.	Height in inches when Planted on the 30th August 1862.	Height in inches on the 28th February 1865.	Height in inches on the 31st March 1865.	Growth in inches during March 1865.	By whom Planted.
1	23	114	115	1	His Excellency Sir William Denison.
2	16½	102½	102½	½	
3	19	106	106	-	
4	15	99½	100	½	
5	27	118	118	-	
6	20	91	91½	½	
7	20	109	109	-	J. W. Breeks, Esq.
8	18	110	110½	½	Dr. Sanderson.
9	20	113	114	1	J. D. Sim, Esq.
10	20	114½	114½	-	Lieutenant M'Leod.
11	18	99	99½	½	P. Grant, Esq.
12	-	55	55	-	Plant cut down for bark.

TABLE II. exhibits the growth of eleven plants of *Chinchona succirubra* planted out by His Excellency the Governor, and other gentlemen, at Nedddivuttam, on the 30th August 1862. The average growth of these plants during the month is ¼ths of an inch, being ½ths of an inch under the growth of last month.

One of the two plants cut down on the 20th of March 1863 for the bark submitted to Mr. Howard for analysis, has made strong shoots of 55 inches in height, but has not increased in height during the current month.

TABLE III.

SHOWING the Height of Twelve Plants of *C. officinalis*, planted on the Dodabetta Plantation at Ootacamund, on the 30th September 1863.

Number of Plants.	Height in Inches when Planted on the 30th September 1863.	Height in Inches on the 28th February 1865.	Height in Inches on the 31st March 1865.	Growth in Inches during March 1865.	REMARKS.
1	19	72	74	2	The twelve plants of <i>Chinchona officinalis</i> (a shrubby species) on the Dodabetta Plantation gives an average growth of $2\frac{1}{4}$ inches, or 1 inch above the growth of last month.
2	14 $\frac{1}{2}$	64	68	4	
3	28	76	78 $\frac{1}{2}$	2 $\frac{1}{2}$	
4	22	79	80 $\frac{1}{2}$	1 $\frac{1}{2}$	
5	21 $\frac{1}{2}$	75	76 $\frac{1}{2}$	1 $\frac{1}{2}$	
6	28	82 $\frac{1}{2}$	86	3 $\frac{1}{2}$	
7	22 $\frac{1}{2}$	78	76	3	
8	21 $\frac{1}{2}$	72	74	2	
9	21 $\frac{1}{2}$	80	81	1	
10	19 $\frac{1}{2}$	78	74	1	
11	24	76	78	2	
12	24	77	79	2	

TABLE IV.

REGISTER of *Chinchona* Plants Distributed.

NAMES.	STATION.	Number of Plants.
Mr. F. N. Maltby -	Travancore -	16
Dr. Junghuhn -	Java -	56
Mr. A. R. Lascelles -	Ootacamund -	12
Mr. M. Anderson -	Jamaica -	2
Dr. Wiche -	Bombay -	10
Dr. T. Anderson -	Calcutta -	554
Dr. Jamieson -	Saharanpore -	107
Professor Lees -	Calcutta -	547
Rajah of Travancore -	Travancore -	521
Major Morgan -	Ootacamund -	1,534
Mr. E. T. Fitzgerald -	Calcutta -	558
Mr. J. W. B. Money -	- ditto -	1,369
Dr. W. Bourne -	- ditto -	532
Captain Cox -	Wynad -	6
Mr. Hollock -	- ditto -	2
Mr. T. Sheffield -	Ootacamund -	12
Dr. F. Day -	Cochin -	100
Mr. Brown -	Tellicherry -	12
Mr. J. Hall -	Ootacamund -	144
Mr. J. Knop -	- ditto -	18
Captain Lees -	Bengal -	281
Mr. W. H. Rayne -	Manantoddy -	424
Rev. — Sawyer -	Ootacamund -	1,018
Mr. Friend -	- ditto -	512
Mr. Hollock -	- ditto -	1
Mr. J. Pierie -	Seegoor -	12
Colonel Scott -	Ootacamund -	1,226
Mr. Berend -	Cachar -	275
Reverend J. Hunter -	Coonoor -	12
Mr. J. Mullaly -	- ditto -	24
Mr. W. H. Stanes -	- ditto -	1,262
Colonel R. Cooper -	Kotagherry -	12
Mr. F. Cockburn -	- ditto -	12
Colonel Woodfall -	Coonoor -	12
Mr. C. Anderson -	- ditto -	24
Colonel Angelo -	Ootacamund -	12
Reverend E. Laseron -	- ditto -	12
Captain R. N. Taylor -	Coorg -	96
Major W. Agnew -	Assam -	139
Mr. V. H. Levinge -	Madura -	12
Chief Commissioner of -	Nagpore -	28
Mr. Fletcher -	Ootacamund -	24
Gool Mahomed -	- ditto -	20

The number of plants issued to the public during this month is 580, making the total number of plants distributed 58,437.

TABLE IV.—REGISTER of Chinchona Plants Distributed—*continued.*

NAMES.	STATION.	Number of Plants.	REMARKS.
General McCleverty	New Zealand	23	
Mr. W. Robinson	Kotagherry	30	
„ Crake	Wynad	12	
„ H. R. Dawson	Seegoor	12	
Captain Mann	Coorg	48	
Mr. E. Roberts	ditto	530	
„ H. Russell	Wynad	12	
Rev. — Wait	Coonoor	2	
Collector of Belgaum	Belgaum	28	
Collector of Honore	Honore	28	
Dr. Ross	ditto	15	
His Excellency the Governor	Bombay	158	
Mr. H. Hinde	Wynad	12	
„ E. B. Thomas	Coonoor	12	
Rajah of Poonganoor	Poonganoor	12	
Major Grant	Wellington	226	
Messrs. Thomson, Shaw & Co.	Poonganoor	28	
Mr. J. H. Trinson	ditto	31	
Dr. Muller	Melbourne	28	
Mr. Tyrrell	Mysore	12	
Dr. Sayers	Vellore	12	
Major C. P. Taylor	Ootacamund	5,250	
Doctor Wilson	ditto	6	
Mr. Schnarrie	ditto	15,000	
Captain Fuller	Coonoor	266	
Mr. Drummond	Ootacamund	224	
Captain Jennings	ditto	1,756	
Lieutenant H. B. Montmorency	Bangalore	6	
Mr. McHutchin	Ootacamund	3	
Colonel Molesworth	ditto	6	SE
Mr. C. Gray	Coonoor	12	
„ H. B. Leddell	Ootacamund	12	
„ Minchin	Wynad	1,600	
His Excellency the Governor	Vizagapatam	35	
Mr. R. F. Phillips	Kotagherry	1,117	
Colonel Cooke	ditto	24	
Mr. G. J. Glasson	Wynad	1,000	
Dr. Macpherson	Mercara	400	
Mr. W. H. Kerr	Coorg	3,100	
„ James	Ootacamund	1,000	
Colonel Whish	Bengal	82	
Mr. K. Mair	Calcutta	1,180	
„ W. Shakespear	ditto	61	
„ E. E. Meakin	ditto	168	
„ C. Ackland	ditto	150	
„ K. McIver	ditto	124	
„ Havelock	Ootacamund	12	
„ H de Facien	Kartairy	6,821	
Major Sweet	ditto	102	
Captain Campbell	Bangalore	6	
Royal Gardens	Mauritius	36	
Honourable W. R. Arbuthnot	Wynad	93	
Mr. H. Maxwell	Bombay	50	
Mrs. C. Smith	Wynad	22	
Captain Beckley	Wellington	200	
Mr. Walsh	Salem	100	
His Excellency the Governor General	Java	175	
Captain Richardson	Kulhatty	381	
Rajah of Poonganoor	Poonganoor	24	
TOTAL Number of Plants		53,437	

Ootacamund,
7 April 1865.

(signed) *W. G. McIvor,*
Superintendent Government Chinchona Plantations.

— No. 45. —

From the Governor of Madras to the Secretary of State for India.

Madras, 11 May 1865.

We have the honour to advise you of the transmission by this mail of a further supply of Chinchona bark to be submitted to Mr. Howard for analysis and report. Enclosed is a memorandum of the bark, together with a letter from the superintendent on the subject.

Enclosure in No. 45.

From *W. G. McIvor*, Esq., Superintendent, Government Chinchona Plantations, Ootacamund, to *C. G. Master*, Esq., Secretary to Government, Revenue Department.

Sir,

Ootacamund, 3 May 1865.

1. I HAVE the honour to forward, by banghy, a box containing a further supply of Chinchona bark, as per memorandum annexed, for transmission to the Right Honourable the Secretary of State for India, in order that they may be submitted to Mr. Howard for analysis and report.

2. The bark now forwarded was removed from the plants in the early part of April last, or as the sap begins to rise, as at this season the bark separates freely from the wood.

3. Specimens Nos. 2 and 3 are renewed barks; these attain extraordinary thickness in a short period of growth; and if they contain a proportionate quantity of alkaloids, this system of treating the plants appears to offer greater advantages than the other methods proposed.

4. I may observe that further observation seems to establish that this system of removing strips of bark from the stems of the plants can be practised without injury, provided the wound is instantly covered with damp moss; inattention to covering the wounds having produced the bad effects detailed in my letter of the 17th March 1864.*

* Vide Despatch to Secretary of State, 23 March 1865. No. 25 Misc.

MEMORANDUM.

Chinchona succirubra.

No. 1. Bark of three years and five months' growth, thickened by the application of moss.

No. 2. Renewed bark of one year and five months' growth, being re-produced on the same portion of a stem, which produced the bark given to Dr. de Vry in November 1863, and from which that gentleman obtained 8.409 per cent. of alkaloid.

No. 3. Renewed bark of one year's growth and gathered from portions of the stem which yielded No. 1 bark, submitted to Mr. Howard in the spring of 1864.

No. 4. Bark of two years and five months' growth not thickened by the application of moss.

Chinchona Calisaya.

No. 5. Bark of two years and five months' growth.

Chinchona Condaminza.

No. 6. Bark of one year and seven months' growth.

Chinchona micrantha.

No. 7. Bark of two years and five months' growth, thickened by the application of moss.

No. 8. Bark of same growth but not thickened by the application of moss.

(signed) *W. G. McIvor*,
Superintendent, Government Chinchona Plantations.

Ootacamund, 3 May 1865.

— No. 46. —

From the Government of Madras to the Secretary of State for India.

Madras, 26 May 1865.

We have the honour to forward for your information the accompanying tabular report on the number, condition, &c., of the Chinchona plants on the Neilgherries on the 30th April 1865.

Enclosure to No. 46.

REPORT on the Number, Distribution, and Condition of Chinchona Plants on the Neilgherries, on the 30th April 1865.

No. of Species.	Botanical Names.	Commercial Names.	Number of Plants.	Value per Lb. of Dry Bark in the London Market.	REMARKS.
1	<i>C. succirubra</i> - -	Red Bark - -	150,686	s. d. s. d. 2 6 to 8 9	The weather being favourable, planting operations have been commenced. The number of plants planted out during the month being 2,020, making the total number of plants permanently planted out, 167,371. The increase by propagation is 27,356, being 2,628 plants above the average of the last six months, making the total number of plants at the end of the month 658,105.
2	<i>C. Calisaya</i> - -	Yellow Bark - -	2,778	2 10 to 7 -	
3	<i>C. officinalis</i> , var. <i>Condaminea</i> (<i>C. Uritusinga</i>).	Original Loxa Bark -	4,323	2 10 to 7 -	
4	<i>C. officinalis</i> , var. <i>Bouplandiana</i> (<i>C. Chahuarguera</i>).	Select Crown Bark -	367,713	2 10 to 6 -	
5	<i>C. crespilla</i> - -	Fine Crown Bark -	2,729	2 10 to 6 -	
6	<i>C. lanceifolia</i> - -	Pitayo Bark - -	52	1 8 to 2 10	
7	<i>C. nitida</i> - -	Genuine Grey Bark -	2,786	1 8 to 2 9	
8	<i>C. Species without name.</i>	Fine Grey Bark -	8,500	1 8 to 2 10	
9	<i>C. micrantha</i> - -	Grey Bark - -	14,724	1 8 to 2 9	
10	<i>C. Peruviana</i> - -	Finest Grey Bark -	3,329	1 8 to 2 10	
11	<i>C. Pahudiana</i> - -	Unknown - -	425	Unknown.	
TOTAL Number of Plants - - -			558,105		

TABLE II.

MEMORANDUM of the Growth of Eleven Plants of *C. succirubra*, planted on the Second Denison Plantation, at Neddivuttum, on the 30th August 1862.

Number of Plants.	Height in Inches when Planted, on 30 August 1862.	Height in Inches on 31 March 1865.	Height in Inches on 30 April 1865.	Growth in Inches during April 1865.	By whom Planted.
1	23	115	115½	½	His Excellency Sir W. Denison. J. W. Brecks, Esq. Dr. Sanderson. J. D. Sim, Esq. Lieutenant McLeod. P. Grant, Esq. Plant cut down for bark.
2	16½	102½	102½	½	
3	19	106	106½	½	
4	15	100	101	1	
5	27	118	119	1	
6	20	91½	92	½	
7	20	109	109½	½	
8	18	110½	112	1½	
9	20	114	114½	½	
10	20	114½	115	½	
11	18	99½	100	½	
12	-	55	56	1	

TABLE II. exhibits the growth of 11 plants of *Chinchona succirubra* planted out by his Excellency the Governor, and other gentlemen, at Neddivuttum, on the 30th August 1862. The average growth of these plants during the month is ¾ of an inch, or ¼ of an inch above the growth of last month.

One of the two plants cut down on the 20th March 1863 for the bark submitted to Mr. Howard for analysis has made strong shoots of 56 inches in height, giving the growth of one inch during the month.

TABLE III.

SHOWING the Height of Twelve Plants of *C. officinalis*, planted on the Dodabetta Plantation, at Ootacamund, on the 30th September 1863.

Number of Plants.	Height in Inches when Planted on 30 September 1863.	Height in Inches on 31 March 1865.	Height in Inches on 30 April 1865.	Growth in Inches during April 1865.	REMARKS.
1	19	74	76	2	The 12 plants of <i>C. officinalis</i> (a shrubby species) on the Dodabetta Plantation, gives an average growth of $2\frac{1}{2}$ inches or $1\frac{1}{2}$ of an inch above the growth of last month.
2	14 $\frac{1}{2}$	68	71	3	
3	28	78 $\frac{1}{2}$	81 $\frac{1}{2}$	3	
4	22	80 $\frac{1}{2}$	82 $\frac{1}{2}$	2	
5	21 $\frac{1}{2}$	76 $\frac{1}{2}$	78	1 $\frac{1}{2}$	
6	28	86	89	3	
7	22 $\frac{1}{2}$	76	79	3	
8	21 $\frac{1}{2}$	74	76	2	
9	21 $\frac{1}{2}$	81	82 $\frac{1}{2}$	1 $\frac{1}{2}$	
10	19 $\frac{1}{2}$	74	76	2	
11	24	78	80	2	
12	24	79	81	2	

TABLE IV.

REGISTER of Chinchona Plants Distributed.

NAMES.	STATION.	Number of Plants.
Mr. F. N. Maltby - - - -	Travancore - - - -	16
Dr. Junghuhn - - - -	Java - - - -	56
Mr. A. R. Lascelles - - - -	Ootacamund - - - -	12
Mr. M. Anderson - - - -	Jamaica - - - -	2
Dr. Wiehe - - - -	Bombay - - - -	10
Dr. T. Anderson - - - -	Calcutta - - - -	554
Dr. Jamieson - - - -	Saharanpore - - - -	107
Professor Lees - - - -	Calcutta - - - -	547
Rajah of Travancore - - - -	Travancore - - - -	521
Major Morgan - - - -	Ootacamund - - - -	1,534
Mr. E. T. Fitzgerald - - - -	Calcutta - - - -	558
Mr. J. W. B. Money - - - -	- ditto - - - -	26,369
Dr. W. Bourne - - - -	- ditto - - - -	532
Captain Cox - - - -	Wainad - - - -	6
Mr. Hollock - - - -	- ditto - - - -	2
Mr. T. Sheffield - - - -	Ootacamund - - - -	12
Dr. F. Day - - - -	Cochin - - - -	100
Mr. Brown - - - -	Tellicherry - - - -	12
Mr. J. Hall - - - -	Ootacamund - - - -	144
Mr. J. Knop - - - -	- ditto - - - -	18
Captain Lees - - - -	Bengal - - - -	281
Mr. W. H. Rayne - - - -	Manantoddy - - - -	424
Reverend — Sawyer - - - -	Ootacamund - - - -	1,018
Mr. Friend - - - -	- ditto - - - -	512
Mr. Hollock - - - -	- ditto - - - -	1
Mr. J. Perie - - - -	Seegoor - - - -	12
Colonel Scott - - - -	Ootacamund - - - -	1,226
Mr. Berend - - - -	Cachar - - - -	275
Rev. J. Hunter - - - -	Coonoor - - - -	12
Mr. J. Mullaly - - - -	- ditto - - - -	24
Mr. W. H. Stanes - - - -	- ditto - - - -	1,262
Colonel R. Cooper - - - -	Kotagherry - - - -	12
Mr. F. Cockburn - - - -	- ditto - - - -	12
Colonel Woodfall - - - -	Coonoor - - - -	12
Mr. C. Anderson - - - -	- ditto - - - -	24
Colonel Angelo - - - -	Ootacamund - - - -	12
Rev. E. Laseron - - - -	- ditto - - - -	12
Capt. R. N. Taylor - - - -	Coorg - - - -	96
Major W. Agnew - - - -	Assam - - - -	130
Mr. V. H. Levinge - - - -	Madura - - - -	12
Chief Commissioner of Nagpore - - - -	Nagpore - - - -	28
Mr. Fletcher - - - -	Ootacamund - - - -	24
Gool Mahomed - - - -	- ditto - - - -	20

The number of plants issued to the public during the month is 26,176, making the total number of plants distributed 78,612.

TABLE IV.—REGISTER of Chinchona Plants Distributed—*continued.*

NAMES.	STATION.	Number of Plants.	REMARKS.
General McCleverty	New Zealand	23	
Mr. W. Robinson	Kotagberry	30	
Mr. Crake	Wainad	12	
Mr. H. R. Dawson	Seegoor	12	
Captain Mann	Coorg	48	
Mr. E. Roberts	- ditto	580	
Mr. H. Russell	Wainad	12	
Rev. — Wait	Coonoor	2	
Collector of Belgaum	Belgaum	28	
Collector of Honore	Honore	28	
Dr. Ross	- ditto	15	
His Excellency the Governor	Bombay	158	
Dr. H. Hinde	Wainad	12	
Mr. E. B. Thomas	Coonoor	12	
Rajah of Poonganoor	Poonganoor	12	
Major Grant	Wellington	226	
Messrs. Thomson, Shaw, & Co.	Poonganoor	28	
Mr. J. H. Trinson	- ditto	31	
Dr. Muller	Melbourne	28	
Mr. Tyrrell	Mysore	12	
Dr. Sayers	Vellore	12	
Major C. P. Taylor	Ootacamund	6,250	
Dr. Wilson	- ditto	6	
Mr. Schnarrie	- ditto	15,000	
Captain Fuller	Coonoor	417	
Mr. Drummond	Ootacamund	224	
Captain Jennings	- ditto	1,756	
Lieut. H. B. Montmorency	Bangalore	6	
Mr. McHutchin	Ootacamund	3	
Colonel Molesworth	- ditto	6	
Mr. C. Gray	Coonoor	12	
Mr. H. B. Leddell	Ootacamund	12	
Mr. Minchin	Wynad	1,600	
His Excellency the Governor	Vizagapatam	35	
Mr. R. F. Phillips	Kotagberry	1,117	
Colonel Cooke	- ditto	24	
Mr. G. J. Glasson	Wynad	1,000	
Dr. Macpherson	Mercara	400	
Mr. W. H. Kerr	Coorg	3,100	
Mr. James	Ootacamund	1,000	
Colonel Whish	Bengal	82	
Mr. K. Mair	Calcutta	1,180	
Mr. W. Shakespeare	- ditto	61	
Mr. E. E. Meakin	- ditto	168	
Mr. C. Ackland	- ditto	150	
Mr. K. McIver	- ditto	124	
Mr. Havelock	Ootacamund	12	
Mr. H. de Facien	Kartaury	6,821	
Major Sweet	- ditto	102	
Captain Campbell	Bangalore	6	
Royal Gardens	Mauritius	36	
Honourable W. R. Arbuthnot	Wynad	93	
Mr. H. Maxwell	Bombay	50	
Mrs. C. Smith	Wynad	22	
Captain Beckley	Wellington	200	
Mr. Walsh	Salem	100	
His Excellency the Governor General	Java	175	
Captain Richardson	Kulhutty	381	
Rajah of Poonganoor	Poonganoor	24	
His Excellency the Governor	Madras	24	
TOTAL Number of Plants		78,612	

Ootacamund,
13 May 1865.

(signed) *W. G. McIvor*,
Superintendent Government Chinchona Plantations.

— No. 47. —

From the Government of Madras to the Secretary of State for India.

Madras, 17 June 1865.

Proceedings of
Government, 12
June 1865, Nos.
239, 240.

1. WITH reference to paragraph 5 of your Despatch, dated 15th April 1865, Public, No. 12, we have the honour to forward for your information the accompanying report from the Principal Inspector General, Medical Department, on the result of the trial of Chinchona leaves in cases of fever. This report is very meagre and unsatisfactory, but we have issued orders for the repetition of the experiment with leaves of the various kinds of Chinchona, and decoctions or extracts prepared in different ways. The result, when reported, will be duly made known to you.

2. Adverting to paragraph 6 of the Despatch under reply, we have to observe that the superintendent's report on the Chinchona plantations for the year 1863-4 was forwarded to you in March * last, and that portions † thereof relating to the culture of the plant were separately printed, and 300 copies forwarded to Mr. McIvor ‡ for distribution.

Enclosure 1, in No. 47.

MEMORANDUM from the Principal Inspector General, Medical Department, Fort Saint George, 20th May 1865.

Extract from a Letter from the Physician, General Hospital, 30th November 1863.

"Chinchona leaves from Government Garden, Ootacamund, received on 11th April 1863.
"Its decoction prepared with—

Chinchona leaves	- - -	3 x.
Water	- - -	o j.
Acid sulphuric dil.	- - -	3 ij.

and strained, was found to be a good tonic, but quite useless as a febrifuge.

"The specimens of decoction and infusion of Chinchona prepared at Ootacamund, with one-third their respective bulks of spirits, became rather turbid a few days after they were received; and the infusion was tried only once, and that was in a case of intermittent fever. It occasioned febrile disturbance with dryness of tongue, and was therefore discontinued. So large a quantity of spirit, with the very small quantity of alkaloid likely to be present in these infusions and decoctions rendered their employment inadmissible in the generality of periodic fevers. In this hospital $\frac{3}{4}$ i. to $\frac{3}{4}$ iss. is found to be the best proportion of arrack to be given with 10 grains of sulphate of quinine."

(signed) "W. R. Cornish,
"Secretary to Principal Inspector General, Medical Department."

ORDER of the Madras Government, 12th June 1865.

1. THIS report is meagre and unsatisfactory, and the Principal Inspector General will be requested to issue instructions for careful repetition of the experiment with leaves of the various kinds of Chinchona, and with decoctions or extracts prepared in different ways. The superintendent of the Government Chinchona plantations will be instructed to forward the necessary supply of leaves for the purpose.

2. Meanwhile the present report will be communicated to the Secretary of State, with reference to his Despatch, 16th January 1863, No. 2.

Enclosure 2, in No. 47.

From W. G. McIvor, Esq., Superintendent Government Plantation, Ootacamund, to J. D. Sim, Esq., Secretary to Government, Revenue Department of Ootacamund.

Sir,

21 October 1864.

WITH reference to my letter, No. 108, of the 9th July 1864, forwarding the Report on the Government Chinchona Plantations and Botanical Gardens, for the official year 1863-64, I have the honour to request the favour of being furnished, as early as possible, with 300 printed copies in pamphlet size, 6 by 9½ inches, of Paras. 9 to 13 and 24 to 38 inclusive

* To England, 14th March 1865, No. 16, Miscellaneous.

† Paragraphs 9 to 13, and 24 to 38.

‡ From Superintendent Chinchona Plantations, 21st October 1864, No. 165.

inclusive of the above report, in order to enable me to distribute as early as possible information on the modifications which have been found necessary in the cultivation of Chinchona.

2. I make this request as I have numerous applications for a description of these modifications, which I find it impossible to comply with except by means of printed forms.

— No. 48. —

From the Government of Madras to the Secretary of State for India.

Madras, 11 July 1865.

We have the honour to forward for your information the accompanying tabular report on the number, condition, &c., of the Chinchona plants on the Neilgherries on the 31st May 1865.

Enclosure in No. 48.

REPORT on the Number, Distribution, and Condition of Chinchona Plants on the Neilgherries, on the 31st May 1865.

No. of Species.	Botanical Names.	Commercial Names.	Number of Plants.	Value per Lb. of Dry Bark in the London Market.		REMARKS.
				s. d.	s. d.	
1	<i>C. succirubra</i> - -	Red Bark - -	160,711	2 8	to 8 9	The weather being favourable, planting operations have been commenced, the number of plants planted out during the month being 14,865, making the total number of plants permanently planted out 182,236. The increase by propagation is 23,680, being 2,094 plants above the average of the last six months, making the total number of plants at the end of the month 581,578.
2	<i>C. Calisaya</i> - -	Yellow Bark - -	2,748	2 10	to 7 -	
3	<i>C. officinalis</i> , var. <i>Gondaminea</i> (<i>C. Uritausinga</i>).	Original Loxa Bark -	4,593	2 10	to 7 -	
4	Ditto var. <i>Bonplandiana</i> (<i>C. Chahuar-guena</i>).	Select Crown Bark -	380,683	2 10	to 7 -	
5	<i>C. crespilla</i> - -	Fine Crown Bark -	3,059	2 10	to 6 -	
6	<i>C. lancifolia</i> - -	Pitayo Bark - -	52	1 8	to 2 10	
7	<i>C. nitida</i> - -	Genuine Grey Bark -	2,786	1 8	to 2 9	
8	<i>C. species</i> without name - -	Fine Grey Bark -	3,500	1 8	to 2 10	
9	<i>C. micrantha</i> - -	Grey Bark - -	14,632	1 8	to 2 9	
10	<i>C. Peruviana</i> - -	Finest Grey Bark -	3,389	1 8	to 2 10	
11	<i>C. Pahudiana</i> - -	Unknown - -	425	Worthless.		
TOTAL Number of Plants - -			5,81,578			

TABLE II.

MEMORANDUM of the Growth of Eleven Plants of *C. succirubra*, planted on the Second Denison Plantation, at Neddivuttum, on the 30th August 1862.

Number of Plants.	Height in Inches when Planted, on 30 August 1862.	Height in Inches on 30 April 1865.	Height in Inches on 31 May 1865.	Growth in Inches during May 1865.	By whom Planted.
1	28	115½	116½	1	His Excellency Sir W. Denison. J. W. Breeks, Esq. Dr. Sanderson. J. D. Sim, Esq. Lieutenant McLeod. P. Grant, Esq. Plant cut down for bark.
2	16½	108½	106	1½	
3	19	106½	107½	1	
4	15	101	101½	½	
5	27	119	120	1	
6	20	92	93	1	
7	20	109½	111	1½	
8	18	102	113	1	
9	20	114½	116	1½	
10	20	105	117	2	
11	18	100	101½	1½	
12	-	56	57½	1½	

TABLE II. exhibits the growth of eleven plants of Chinchona succirubra planted out by his Excellency the Governor and other gentlemen at Neddivuttum, on the 30th August 1862. The average growth of these plants during the month is 1½ inches, or about ½ of an inch above the growth of last month.

One of the two plants cut down on the 20th of March 1863 for the bark, submitted to Mr. Howard for analysis, has made strong shoots of 57½ inches in height, giving the growth of 1½ inches during the month.

TABLE III.

SHOWING the Height of Twelve Plants of *C. officinalis*, planted on the Dodabetta Plantation, at Ootacamund, on the 30th September 1863.

Number of Plants.	Height in Inches when Planted on 30 September 1863.	Height in Inches on 30th April 1865.	Height in Inches on 31 May 1865.	Growth in Inches during May 1865.	REMARKS.
1	19	76	81	5	The 12 plants of <i>Chinchona officinalis</i> (a shrubby species) on the Dodabetta Plantation, gives an average growth of $3\frac{1}{2}$ inches, or $1\frac{1}{2}$ inches above the growth of last month.
2	14 $\frac{1}{2}$	71	76	5	
3	28	81 $\frac{1}{2}$	84	2 $\frac{1}{2}$	
4	22	82 $\frac{1}{2}$	84 $\frac{1}{2}$	2	
5	21 $\frac{1}{2}$	78	82	4	
6	28	89	95	6	
7	22 $\frac{1}{2}$	79	81	2	
8	21 $\frac{1}{2}$	76	78	2	
9	21 $\frac{1}{2}$	82 $\frac{1}{2}$	87	4 $\frac{1}{2}$	
10	19 $\frac{1}{2}$	76	81	5	
11	24	80	85	5	
12	24	81	84	3	

TABLE IV.

REGISTER of *Chinchona* Plants Distributed.

NAMES.	STATION.	Number of Plants.
Mr. F. N. Maltby - - - -	Travancore - - - -	16
Dr. Junghuhn - - - -	Java - - - -	56
Mr. A. R. Lascelles - - - -	Ootacamund - - - -	12
" M. Anderson - - - -	Jamaica - - - -	2
Dr. Wiehe - - - -	Bombay - - - -	10
Dr. T. Anderson - - - -	Calcutta - - - -	554
" Jamieson - - - -	Saharanpore - - - -	107
Professor Lees - - - -	Calcutta - - - -	547
Rajah of Travancore - - - -	Travancore - - - -	521
Major Morgan - - - -	Ootacamund - - - -	1,534
Mr. E. T. Fitzgerald - - - -	Calcutta - - - -	558
Mr. J. W. B. Money - - - -	- ditto - - - -	1,369
Dr. W. Bourne - - - -	- ditto - - - -	532
Captain Cox - - - -	Wainad - - - -	6
Mr. Hallock - - - -	- ditto - - - -	2
" T. Sheffield - - - -	Ootacamund - - - -	12
Dr. F. Day - - - -	Cochin - - - -	100
Mr. Brown - - - -	Tellicherry - - - -	12
" J. Hall - - - -	Ootacamund - - - -	144
" J. Knop - - - -	- ditto - - - -	18
Captain Lees - - - -	Bengal - - - -	281
Mr. W. H. Rayne - - - -	Manantoddy - - - -	424
Rev. — Sawyer - - - -	Ootacamund - - - -	1,018
Mr. Frend - - - -	- ditto - - - -	512
" Hollock - - - -	- ditto - - - -	1
" J. Pierie - - - -	Seegoor - - - -	12
Colonel Scott - - - -	Ootacamund - - - -	1,226
Mr. Berend - - - -	Cachar - - - -	275
Rev. J. Hunter - - - -	Coonoor - - - -	12
Mr. J. Mullaly - - - -	- ditto - - - -	24
" W. H. Stanes - - - -	- ditto - - - -	1,262
Colonel R. Cooper - - - -	Kotagherry - - - -	12
Mr. F. Cockburn - - - -	- ditto - - - -	12
Colonel Woodfall - - - -	Coonoor - - - -	12
Mr. C. Anderson - - - -	- ditto - - - -	24
Colonel Angelo - - - -	Ootacamund - - - -	12
Rev. E. Laseyron - - - -	- ditto - - - -	12
Captain R. N. Taylor - - - -	Coorg - - - -	96
Major W. Agnew - - - -	Assam - - - -	139
Mr. V. H. Levinge - - - -	Madura - - - -	12
Chief Commissioner of - - - -	Nagpore - - - -	28
Mr. Fletcher - - - -	Ootacamund - - - -	24
Gool Mahomed - - - -	- ditto - - - -	20

The number of plants issued to the public during the month is 207, making the total number of plants distributed 78,819.

TABLE IV.—REGISTER of Chinchona Plants Distributed—*continued.*

NAMES.	STATIONS.	Number of Plants.	REMARKS.
General McCleverty	New Zealand	23	
Mr. W. Robinson	Kotagherry	30	
" Crake	Waynad	12	
" H. R. Dawson	Seegoor	12	
Captain Mann	Coorg	48	
Mr. E. Roberts	- ditto	580	
" H. Russell	Waynad	12	
Rev. — Wait	Coonoor	2	
Collector of Belgaum	Belgaum	28	
Collector of Honore	Honore	28	
Dr. Ross	- ditto	15	
His Excellency the Governor of	Bombay	158	
Mr. H. Hinde	Waynad	12	
" E. B. Thomas	Coonoor	12	
Rajah of Poonganoor	Poonganoor	12	
Major Grant	Wellington	226	
Messrs. Thomson, Shaw & Co.	Poonganoor	28	
Mr. J. H. Trinson	- ditto	31	
Dr. Muller	Melbourne	28	
Mr. Tyrrell	Mysore	12	
Dr. Sayers	Vellore	12	
Major C. P. Taylor	Ootacamund	5,250	
Dr. Wilson	- ditto	6	
Mr. Schnarrie	- ditto	15,000	
Captain Fuller	Coonoor	417	
Mr. Drummond	Ootacamund	224	
Captain Jennings	- ditto	1,756	
Lieut. H. B. Montmorency	Bangalore	6	
Mr. McHutchin	Ootacamund	8	
Colonel Molesworth	- ditto	6	
Mr. C. Gray	Coonoor	12	
" H. B. Leddell	Ootacamund	12	
" Minohin	Wynad	1,800	
His Excellency the Governor	Vizagapatam	35	
Mr. R. F. Phillips	Kotagherry	1,117	
Colonel Cooke	- ditto	24	
Mr. G. J. Glasson	Wynad	1,000	
Dr. Macpherson	Mercara	400	
Mr. W. H. Kerr	Coorg	3,100	
" James	Ootacamund	1,000	
Colonel Whish	Bengal	82	
Mr. K. Mair	Calcutta	1,180	
" W. Shakespear	- ditto	61	
" E. E. Meakin	- ditto	168	
" C. Ackland	- ditto	150	
" K. McIver	- ditto	124	
" Havelock	Ootacamund	12	
" H. de Facien	Kartaury	6,821	
Major Sweet	- ditto	102	
Captain Campbell	Bangalore	6	
Royal Gardens	Mauritius	36	
Hon. W. R. Arbuthnot	Wynad	98	
Mr. H. Maxwell	Bombay	50	
Mrs. C. Smith	Wynad	22	
Captain Beckley	Wellington	200	
Mr. Walsh	Salem	100	
His Excellency the Governor General	Java	175	
Captain Richardson	Kulhatty	381	
Rajnh of Poonganoor	Poonganoor	24	
His Excellency the Governor	Madras	24	
Mr. J. W. B. Money	Ootacamund	25,000	
Captain Mitcheson	- ditto	50	
Mr. R. H. Elliot	Mungerabad	157	
Total Number of Plants		78,819	

Ootacamund,
14 June 1865.

(signed) W. G. McIvor,
Superintendent Government Chichona Plantations.

— No. 49. —

From the Government of Madras to the Secretary of State for India.

Madras, 25 July 1865.

WE have the honour to forward for your information the accompanying Tabular Report on the Number, Condition, &c., of the Chinchona Plants on the Neilgherries on the 30th June 1865.

Enclosure in No. 49.

REPORT on the Number, Distribution, and Condition of Chinchona Plants on the Neilgherries, on 30 June 1865.

Species.	Botanical Names.	Commercial Names.	Number of Plants.	Value per lb. of Dry Bark in the London Market.		REMARKS.
				s. d.	s. d.	
1	<i>C. succirubra</i> - -	Red Bark - -	1,79,345	2 6	to 8 9	<p>The number of plants planted out during the month is 11,008, making the total permanently planted out in the plantations 1,93,244.</p> <p>One of the flowering plants of <i>C. succirubra</i> (Red bark) has produced a few perfect seeds, and many of this species are now coming into flower, also a few plants of the <i>C. Condamina</i> and <i>C. Pahudiana</i>; 380 seeds of the <i>C. Calisaya</i>, <i>Vera</i>, and <i>Frutex</i>, received from Mr. Markham on the 10th, are now beginning to germinate.</p> <p>The increase by propagation is 40,876, being 18,577 plants above the average of the last six months, making the total number of plants at the end of the month 6,21,840.</p>
2	<i>C. Calisaya</i> - -	Yellow Bark - -	2,726	2 10	to 7 -	
3	<i>C. officinalis</i> , var. <i>Condamina</i> (<i>C. Uritusinga</i>).	Original Loxa Bark	8,074	2 10	to 7 -	
4	<i>Do.</i> var. <i>Bonplandiana</i> (<i>C. Chahuarguera</i>).	Select Crown Bark -	3,98,875	2 10	to 7 -	
5	<i>C. crespilla</i> - -	Fine Crown Bark -	3,059	2 10	to 6 -	
6	<i>C. lancifolia</i> - -	Pitayo Bark - -	64	1 8	to 2 10	
7	<i>C. nitida</i> - -	Genuine Grey Bark	2,786	1 8	to 2 9	
8	<i>C. Species</i> without name.	Fine Grey Bark -	8,500	1 8	to 2 10	
9	<i>C. micrantha</i> - -	Grey Bark - -	14,597	1 8	to 2 9	
10	<i>C. Peruviana</i> - -	Finest Grey Bark -	3,389	1 8	to 2 10	
11	<i>C. Pahudiana</i> - -	Unknown - -	425	Worthless.		
TOTAL Number of Plants - - -			6,21,840			

TABLE II.

MEMORANDUM of the Growth of Eleven Plants of *C. succirubra*, planted on the Second Denison Plantation, at Nedddivuttum, on 30 August 1862.

Number of Plants.	Height in Inches when Planted on the 30th August 1862.	Height in Inches on the 31st May 1865.	Height in inches on the 30th June 1865.	Growth in Inches during June 1865.	By Whom Planted.
1	23	116½	121	4½	<p>His Excellency Sir W. Denison.</p> <p>J. W. Breeks, Esq.</p> <p>Dr. Sanderson.</p> <p>J. D. Sim, Esq.</p> <p>Lieutenant McLeod.</p> <p>P. Grant, Esq.</p> <p>Plant cut down for bark.</p>
2	16½	105	109	4	
3	19	107½	111	3½	
4	15	101½	109½	2	
5	27	120	123	3	
6	20	93	98	5	
7	20	111	112½	1½	
8	18	113	117	4	
9	20	116	117	1	
10	20	117	123	6	
11	18	101½	106½	5	
12	0	57½	64½	7	

TABLE II. exhibits the growth of eleven plants of Chinchona succirubra, planted out by His Excellency the Governor and other gentlemen at Nedddivuttum, on the 30th August 1862. The average growth of these plants during the month is 3½ inches being 2½ inches above the growth of last month.

One of the two plants cut down on the 20th of March 1863 for the bark, submitted to Mr. Howard for analysis, has made strong shoots of 64½ inches in height, giving the growth of 7 inches during the month.

TABLE III.

SHOWING the Height of Twelve Plants of *C. officinalis* planted on the Dodabetta Plantation at Ootacamund on the 30th September 1863.

Number of Plants.	Height in Inches when Planted on the 30th September 1863.	Height in Inches on the 31st May 1865.	Height in Inches on the 30th June 1865.	Growth in Inches during June 1865.	REMARKS.
1	19	81	84	3	The 12 plants of <i>Chinchona officinalis</i> (a shrubby species) on the Dodabetta Plantation, gives an average growth of $3\frac{1}{2}$ inches or $\frac{3}{4}$ ths of an inch under the growth of last month.
2	14 $\frac{1}{2}$	76	79	3	
3	28	84	86	2	
4	22	84 $\frac{1}{2}$	87	2 $\frac{1}{2}$	
5	21 $\frac{1}{2}$	82	85 $\frac{1}{2}$	3 $\frac{1}{2}$	
6	28	95	97 $\frac{1}{2}$	2 $\frac{1}{2}$	
7	22 $\frac{1}{2}$	81	84	3	
8	21 $\frac{1}{2}$	78	81	3	
9	21 $\frac{1}{2}$	87	90 $\frac{1}{2}$	3 $\frac{1}{2}$	
10	19 $\frac{1}{2}$	81	84 $\frac{1}{2}$	3 $\frac{1}{2}$	
11	24	85	89	4	
12	24	84	87 $\frac{1}{2}$	3 $\frac{1}{2}$	

TABLE IV.

REGISTER of Chinchona Plants Distributed.

NAMES.	STATION.	Number of Plants.
Mr. F. N. Maltby -	Travancore	16
Dr. Junghuhn -	Java	56
Mr. A. R. Lascelles -	Ootacamund	12
„ M. Anderson -	Jamaica	2
Dr. Wiche -	Bombay	10
„ T. Anderson -	Calcutta	554
„ Jamieson -	Saharanpore	107
Professor Lees -	Calcutta	547
Rajah of Travancore -	Travancore	521
Major Morgan -	Ootacamund	1,534
Mr. E. T. Fitzgerald -	Calcutta	558
„ J. W. B. Money -	ditto	1,369
Dr. W. Bourne -	ditto	532
Captain Cox -	Wynad	6
Mr. Hollock -	ditto	2
„ T. Sheffield -	Ootacamund	12
Dr. F. Day -	Cochin	100
Mr. Brown -	Tellicherry	12
„ J. Hall -	Ootacamund	144
„ J. Knop -	ditto	18
Captain Lees -	Bengal	281
Mr. W. H. Rayne -	Manantoddy	424
Rev. — Sawyer -	Ootacamund	1,018
Mr. Frend -	ditto	512
„ Hollock -	ditto	1
„ J. Pierie -	Seegoor	12
Colonel Scott -	Ootacamund	1,236
Mr. Berend -	Cachar	275
Rev. J. Hunter -	Coonoor	12
Mr. J. Mullaly -	ditto	24
„ W. H. Stanes -	ditto	1,262
Colonel R. Cooper -	Kotagerry	12
Mr. F. Cockburn -	ditto	12
Colonel Woodfall -	Coonoor	12
Mr. C. Anderson -	ditto	24
Colonel Angelo -	Ootacamund	12
Rev. E. Laseron -	ditto	12
Captain R. N. Taylor -	Coorg	96
Major W. Agnew -	Assam	139
Mr. V. H. Levings -	Madura	12
Chief Commissioner of -	Nagpore	28
Mr. Fletcher -	Ootacamund	24
Gool Mahomed -	ditto	20

The number of plants issued to the public during the month is 414, making the total number of plants distributed 79,233.

TABLE IV.—Register of Chinchona Plants Distributed—*continued.*

NAMES.	STATION.	Number of Plants.	REMARKS.
General McCleverty	New Zealand	23	
Mr. W. Robinson	Kotagherry	30	
Mr. Crake	Wynad	12	
Mr. H. R. Dawson	Seegoor	12	
Captain Mann	Coorg	48	
Mr. E. Roberts	- ditto	530	
Mr. H. Russell	Wynad	12	
Rev. — Wait	Coonoor	2	
Collector of Belgaum	Belgaum	28	
Collector of Honore	Honore	28	
Dr. Ross	- ditto	15	
His Excellency the Governor	Bombay	158	
Mr. H. Hinde	Wynad	12	
Mr. E. B. Thomas	Coonoor	12	
Rajah of Poonganoor	Poonganoor	12	
Major Grant	Wellington	226	
Messrs. Thomson, Shaw & Co.	Poonganoor	28	
Mr. J. H. Trinson	- ditto	31	
Dr. Muller	Melbourne	28	
Mr. Tyrrell	Mysore	12	
Dr. Sayers	Vellore	12	
Major C. P. Taylor	Ootacamund	5,250	
Doctor Wilson	- ditto	6	
Mr. Schnarrie	- ditto	15,000	
Captain Fuller	Coonoor	417	
Mr. Drummond	Ootacamund	224	
Captain Jennings	- ditto	1,756	
Lieut. H. B. Montmorency	Bangalore	6	
Mr. McHutchin	Ootacamund	3	
Colonel Molesworth	- ditto	6	
Mr. C. Gray	Coonoor	12	
Mr. H. B. Leddell	Ootacamund	12	
Mr. Minchin	Wynad	1,600	
His Excellency the Governor	Vizagapatam	35	
Mr. R. F. Phillips	Kotagherry	1,117	
Colonel Cooke	- ditto	24	
Mr. G. J. Glasson	Wynad	1,000	
Dr. Macpherson	Mercara	400	
Mr. W. H. Kerr	Coorg	3,100	
Mr. James	Ootacamund	1,000	
Colonel Whish	Bengal	82	
Mr. K. Mair	Calcutta	1,180	
Mr. W. Shakespear	- ditto	61	
Mr. E. E. Meakin	- ditto	168	
Mr. C. Ackland	- ditto	150	
Mr. K. McIvor	- ditto	124	
Mr. Havelock	Ootacamund	12	
Mr. H. de Facien	Kartairy	6,821	
Major Sweet	- ditto	102	
Captain Campbell	Bangalore	6	
Royal Gardens	Mauritius	36	
Honourable W. R. Arbuthnot	Wynad	98	
Mr. H. Maxwell	Bombay	50	
Mrs. C. Smith	Wynad	22	
Captain Beckley	Wellington	200	
Mr. Walsh	Salem	100	
His Excellency the Governor General	Java	175	
Captain Richardson	Kulhatty	381	
Rajah of Poonganoor	Poonganoor	24	
His Excellency the Governor	Madras	24	
Mr. J. W. B. Money	Ootacamund	25,000	
Captain Mitcheson	- ditto	50	
Mr. R. H. Elliot	Nunjerabad	157	
His Excellency the Governor General	Goa	252	
Colonel Phayre	Rangoon	152	
TOTAL Number of Plants		79,233	

Ootacamund,
14 July 1865.

(signed) *W. G. McIvor,*
Superintendent Government Chinchona Plantations.

— No. 50. —

From Sir *Charles Wood* to the Government of Madras.

India Office, 30 September 1865.

Para. 1. I HAVE considered in Council your Despatches in the Revenue Department, noted in the margin, on the subject of Chinchona cultivation, and have perused, with special interest, Mr. McIvor's valuable report for 1863-64.

No. 11 of 1865, dated 22d Feb.		
" 16	"	14th March.
" 23	"	4th April.
" 27	"	13th "
" 31	"	11th May.
" 34	"	26th "
" 39	"	17th June.
" 48	"	11th July.
" 50	"	25th "

2. I observe, from the statement of expenses connected with Chinchona cultivation, from the commencement of operations to April 30th, 1864, that the actual expenditure has fallen short of the estimate by nearly 4,000 *l*. This result is very satisfactory, and reflects great credit on Mr. McIvor's management.

3. The supply of bark transmitted with your Despatch, dated May 11th, (No. 31), was submitted to Mr. Howard, and I herewith forward 15 copies of the report of his analysis. You will observe that, although this analysis shows that the Neilgherry barks are very rich in febrifuge alkaloids, and that they are, in this respect, incomparably superior to the barks imported from South America, yet that "the crystallisations of quinine are mixed with some sulphate of chinchonidine, which is, commercially, but not medicinally, a disadvantage." At present, quinine is the only product of the bark which has great commercial value, yet it is the opinion of the most eminent chemists, such as Mr. Howard and Dr. De Vry, who have made the analysis of bark their special study, that, of the other Chinchona alkaloids, chinchonidine and quinidine are very nearly as efficacious as quinine, and that chinchonine, though inferior to the other three, is by no means deficient in febrifuge qualities. I consider it very important, as affecting the commercial interests of the Chinchona experiment, that an authoritative medical decision should be pronounced on the relative value of the Chinchona alkaloids, other than quinine, namely, chinchonidine, quinidine, and chinchonine. The best way of attaining this object would be to appoint a Commission in each Presidency, as has been suggested by Sir Ranald Martin, with instructions to test the efficacy of these alkaloids on a scale sufficiently extensive to ensure decisive results. Such a commission should be composed of medical men who have had long experience in the treatment of fevers, and whose report on a question of this nature would have weight with the medical profession generally. I desire that a Commission for this purpose may be nominated in your Presidency, and in the meanwhile I shall give directions for a supply of the alkaloids in question to be carefully prepared at Mr. Howard's manufactory, and sent out in sufficient quantity to ensure a satisfactory trial of their efficacy. The conclusions arrived at by the Commission should be embodied in a report.

4. The important questions connected with the manufactory of the Chinchona febrifuge at Octacamund, which were brought before me in your Despatch, dated August 12th (No. 80), 1863, have received careful consideration, and I now proceed to place you in possession of my general views on the subject.

5. One great object to be attained in the introduction of Chinchona cultivation into India is to provide an abundant supply of the febrifuge at so cheap a rate as to be within the means of the population at large, the coolies employed on public works and private plantations, the small cultivators, their wives and families. In all future operations this object must be kept steadily in view, although it is also desirable that such a return on the produce of the bark should be secured, as will repay the original outlay and subsequent expenditure on the Chinchona undertaking with good interest.

6. There is every reason to expect that both these objects will be fully attained. Bark sent to the London market will, we know, secure good prices, and thus reimburse the Government for the outlay involved in the collection of plants and seeds in South America, their introduction into India, and subsequent cultivation there. A certain proportion of the bark harvest should, therefore, be disposed of in this way; but it is quite clear that if all the bark is sent to England to be manufactured there, the price of the febrifuge, though somewhat

lowered by reason of the increased supply, will still be such as to put the use of quinine and the other Chinchona alkaloids entirely beyond the reach of the working classes of India.

7. I am, therefore, of opinion, that it will be advisable to establish a manufactory of Chinchona alkaloids in the neighbourhood of the plantations, and thus to secure a plentiful supply of the febrifuge in an efficacious and, at the same time, in an exceedingly cheap form.

8. The details of this measure involve the consideration of numerous complicated and difficult questions, and I am not at present in a position to issue definite instructions in regard to them. But Mr. Markham will visit the Chinchona plantations during the ensuing cold season, and submit a report to your Government upon the whole subject, and I shall then be prepared to consider any detailed plan which you may recommend, with a view to the immediate commencement of a system calculated to ensure the above results in connection with the cultivation of Chinchona bark.

9. With reference to the request contained in your Despatch dated March 14 (No. 16), 1865, that a further supply of *C. Pitayensis* seeds may be forwarded to Madras, I have to inform you, that I have already taken steps to obtain a second instalment of the seeds of this valuable species from the forests of Popayan. 40 copies of Mr. Cross's report of his former proceedings in the forests of New Granada are herewith forwarded.

I have, &c.
(signed) C. Wood.

— No. 51. —

REPORT of an ANALYSIS of the Fourth Remittance of BARK from *India*.

From *J. E. Howard*, Esq., F.L.S., to the Under Secretary of State for India,
1 August 1865.

(See Mr. *McIvor's* Letter, dated 3 May 1865, No. 45.)

Sir,

I HAVE the honour to report that I received, and have during the past month devoted much careful attention to the analysis of eight specimens of bark, referred to in a letter from Madras, dated 3d May 1865.

The whole of the samples were in excellent condition, showing the care and skill bestowed on their cultivation. They contrasted most favourably with specimens from South America, of bark used at the present moment in the extraction of quinine.

The mode of analysis I have followed, in the present instance, is that which is employed to ascertain the commercial value, which rests almost entirely with the crystallisable sulphates, with perhaps some slight loss of the residuary product. The results will compare well with those given in Delondre's "Quinologie."

No. 1 gave of crystallised sulphate, per 100 parts	-	-	-	-	-	-	6.00
of alkaloid soluble in extra light ether	-	-	-	-	-	-	0.94
of alkaloid insoluble in the above (therefore chinchonine)	-	-	-	-	-	-	1.06
Memo.—The sulphate refined into white sulphate of quinine in appearance, but this did not stand the test used for commercial sulphate of quinine.							
No. 2 gave of crystallised sulphate	-	-	-	-	-	-	5.00
of alkaloid sol. in E. L. ether	-	-	-	-	-	-	0.90
of alkaloid insol. in E. L. E. (chinchonine)	-	-	-	-	-	-	1.90
Memo.—Refined as above.							
No. 3 gave of cryst. sulphate	-	-	-	-	-	-	2.72
of alkaloids, sol. in alcohol	-	-	-	-	-	-	7.00
Memo.—As I could only submit to examination 165 grains of the bark, the above result must be taken with reserve.							
No. 4 gave of cryst. sulphate	-	-	-	-	-	-	2.43
of alkaloid sol. in E. L. E.	-	-	-	-	-	-	2.03
of alkaloid insol. in E. L. E. (Chinc.)	-	-	-	-	-	-	0.60
Memo.—This specimen gave a product not refining quite so well as No. 1.							

No. 5.

No. 5 gave of cryst. sulphate	-	-	-	-	-	-	-	-	0.70
of alkaloid sol. in E. L. E.	-	-	-	-	-	-	-	-	0.10
of do. do. but crystallised by evaporation	-	-	-	-	-	-	-	-	0.26
of do. insol. in E. L. E. (Chinc.)	-	-	-	-	-	-	-	-	a trace.
Memo.—This sulphate did not stand the ether test.									
No. 6 gave of cryst. sulphate	-	-	-	-	-	-	-	-	0.90
of alkaloid sol. in E. L. E.	-	-	-	-	-	-	-	-	0.60
of do. insol. (Chinc.)	-	-	-	-	-	-	-	-	a trace.
Memo.—The tests showed quinine and chinchonidine.									
No. 7 gave of cryst. sulphate	-	-	-	-	-	-	-	-	5.82
of alkaloid sol. in E. L. E. (aricine)	-	-	-	-	-	-	-	-	0.29
of alkaloid insol. in E. L. E. (Chinc.)	-	-	-	-	-	-	-	-	0.39
Memo.—This sulphate is that of commercial quinidine, and contains probably no quinine.									
No. 8 gave of cryst. sulphate	-	-	-	-	-	-	-	-	1.26
of alkaloid sol. in E. L. E.	-	-	-	-	-	-	-	-	0.60
of alkaloid insol. in E. L. E. (Chinc.)	-	-	-	-	-	-	-	-	a trace.
Memo.—The product similar to that of No. 7.									

I beg to direct special attention to the remark, that the fine white crystallised sulphate of quinine (apparently), made from the bark of *C. succirubra* will not stand the test which is employed to distinguish the pure article in commerce. The cause of this I stated, in my first report, viz., that "the crystallisations obtained are mixed with some sulphate of chinchonidine, which is commercially (but not medicinally) a disadvantage, and one which always attends the products of red bark." It is, of course, possible to separate the chinchonidine, but then this must very seriously diminish the per centage of six per cent. I obtained from this gross product little more than four per cent. refined in the first instance, though more subsequently, and of this I ascertained about 10 per cent. as chinchonidine. This difficulty must be looked steadily in the face, and I would suggest that it may be obviated, either by a change being wrought in the opinion of the medical world as to the value of chinchonidine as a medicine, or by the plant being encouraged to produce quinine instead of chinchonidine.

The first might be, very probably, the result of a commission of inquiry composed of competent medical practitioners. I may mention that the late Dr. Royle entered zealously, at my suggestion, into the question, and satisfied himself by experiment as to the value of chinchonidine; but I am not aware that he left any written record of the result he attained. My own experiments confirm this view of the question, and I have shown* that this alkaloid, which must not be confounded with chinchonine, must have constituted, in whole or in part, the therapeutic agent in the cure of the Countess of Chinchon, as also that it was the alkaloid successfully employed at Philadelphia. The second alternative may seem visionary at first sight, but when we consider the results at which Mr. McIvor has arrived, and further, the circumstances under which chinchonidine is produced, this view of the case may be altered.

In No. 7, we have an illustration of what careful cultivation will do, as the plant *C. micrantha*, which (with its congeners the grey barks) produces largely and chiefly chinchonine in its native climate of Huanuco,† now produces a very small portion of chinchonine, and a large quantity of the allied alkaloid quinidine. This is, then, a hopeful change, if time should confirm the observation.

Then chinchonidine seems almost always to accompany quinine in greater or less abundance. It does so in the *Calisaya* of Bolivia, in the lancifolia barks of New Granada, and in various barks of Ecuador and Peru, and markedly in the best of the barks of Loxa. It is highly probable that a very slight circumstance in the growth may determine the production of one or other alkaloid. Dr. Herapath has shown in a communication to the Royal Society, "Researches on the Chinchona Alkaloids,"‡ that the quinine and chinchonidine salts

* "Illustration of Nueva Quinologia sub voc. Chatnuarjuera."

† A peculiar climate, of which I have recorded Mr. Pritchett's description under head *C. micrantha*.

‡ Dated 19th June 1857.

salts agree closely among themselves, and differ widely from the quinidine and chinchonine compounds.

I may further remark, that the *Chinchona succirubra* is a tree which varies greatly in its products in its native forests, and that the *Chinchona micrantha*, in Bolivia, approaches to the character of a *Calisaya*, as I have noticed under that head; its bark has a different appearance from that of Huanuco, and again this now sent home varies widely from either of the above. I notice in examination, the peculiar yellow colouring matter common, it seems, to all the forms of the plant, as I have before noticed.

The *Calisaya* bark sent this time by Mr. McIvor is, I fear, an illustration of the possibility of change in the wrong direction, as it contains far too large a percentage of chinchonidine in proportion to the quinine. The appearance of the bark indicates a not very vigorous growth, or at all events it differs from that it assumes in its native locality. It would never be recognised as the bark of *Chinchona Calisaya*.

The bark of No. 6 is recognised by an experienced dealer as "thin rusty crown, worth 1 s. 3 d. to 1 s. 4 d. per lb."§ It is, I presume, the bark of the variety *Bonplandiana*, i. e., the *Colorada del Rey*, as brought home by Cross; it is remarked as more red than is customary with rusty crown.

As the quantity of bark in No. 1 and No. 4 was not exhausted, in my experiments, I have returned 1,000 grains of each of these, thinking that it would be a satisfaction to the Government to engage Dr. de Vry, whose chemical skill and experience are so well known, in further researches on the subject.

I have, &c.

(signed) John Eliot Howard.

— No. 52. —

From Mr. Merivale to Mr. Howard.

Sir,

India Office, London, 28 September 1865.

I AM directed by the Secretary of State for India to acknowledge the receipt of your report of an analysis of the fourth remittance of chinchona bark from the Neilgherry Hills, and to express to you his thanks for the careful attention you have devoted to this important investigation. The results of the analysis are, on the whole, very satisfactory.

2. Sir Charles Wood is impressed with the necessity of obtaining decisive professional opinions on the relative efficacy of the different *Chinchona* alkaloids; and he is of opinion that it will be advisable to appoint medical commissions in India to report upon the subject. It will therefore be necessary to send out a sufficient quantity of the alkaloids in question to ensure a satisfactory trial of their efficacy, and I am to inquire whether you are willing, and if so, upon what terms, to enter into a contract to supply salts of chinchonidine, quinidine, and chinchonine, specially prepared at your own manufactory, in such quantity as may be required.

I am, &c.

(signed) Herman Merivale.

J. E. Howard, Esq.,
2, Lordship-lane, Tottenham, N.

— No. 53. —

From Mr. Merivale to Sir Ranald Martin.

Sir,

India Office, 30 September 1865.

I AM desired by the Secretary of State for India in Council to enclose for your information a copy of a report by Mr. Howard, the quinine manufacturer, on an analysis of specimens of *Chinchona* bark recently received from the Neilgherry Hills, and to call your special attention to the first two paragraphs.

2. Sir

§ From Messrs. Jenkin and Phillips to Mr. J. E. Howard.—"51, Lime Street, 21st July 1865.—The sample of bark you left with us appears to be thin rusty crown, worth 1 s. 3 d.—1 s. 4 d., per lb. We thank you for the sight of it."

2. Sir Charles Wood considers it very important, as affecting the commercial interests of the Chinchona experiment, that an authoritative medical decision should be pronounced on the relative value of the Chinchona alkaloids, other than quinine, namely, chinchonidine, quinidine, and chinchonine. It is his intention to instruct the Governments in India to nominate commissions, composed of medical men, to test and report upon the efficacy of these alkaloids. A supply of them will be carefully prepared by Mr. Howard, and I am to request that you will state what quantity, in your opinion, should be sent to each Presidency, in order to ensure a satisfactory trial of their efficacy. I may add, that quinine has been indented for, during the last three years, in the following quantities:—

	1862.	1863.	1864.
Bengal - - - - -	Nil.	<i>Lbs.</i> 865	<i>Lbs.</i> 2,016
Madras - - - - -	Nil.	Nil.	650
Bombay - - - - -	Nil.	Nil.	Nil.

Sir Ranald Martin, M.D.,
37, Upper Brook-street.

I am, &c.
(signed) *Herman Merivale.*

— No. 54. —

From Sir *Ranald Martin* to Mr. *Merivale*.

Sir, 37, Upper Brook-street, 3 October 1865.

I HAVE the honour to report, for the information of the Secretary of State for India in Council, in reference to your letter of the 30th ultimo, with its enclosure, and chiefly to the first two paragraphs in page 4 of Mr. Howard's report, as follows:—

2. I consider it of the greatest importance that reliable experiments on the relative values of the Chinchona alkaloids be instituted without delay; for we are as yet without data for forming any satisfactory conclusions on the subject.

3. These alkaloids are so similar in their chemical constitution, and in many of their properties, that I cannot think we are doing right in confining our attention almost exclusively to one of them (quinine), leaving the others almost wholly without notice.

4. The composition of chinchonidine is the same as that of chinchonine; while, as the experiments of Mr. Howard show, the difficulty of separating it from quinine (while chinchonine is easily separable) seems to constitute it a link between the alkaloids.

5. Again, the so-called amorphous quinine (quinoidine) is identical in composition with quinine; it stands in the same relation to quinine that treacle does to sugar, that is, it is quinine slightly altered, probably in the process of manufacture.

6. The following table indicates the relative commercial value of the best known Chinchona alkaloids:—

Sulphate of Quinine, per lb.	- - - - -	s. d.
„ Quinidine „	- - - - -	80 -
„ Chinchonine „	- - - - -	56 -
Quinoidine „	- - - - -	11 -
		2 9

7. I cannot think that these articles differ medicinally to anything like the same extent as their values; and if it can be satisfactorily established that the cheaper alkaloids are equal, or nearly equal, in power to the higher price, it would be a material and important gain to hospitals, and to the treatment of the poor all over the world.

8. I am therefore disposed to think that Mr. Howard is justified in supposing that chinchonidine is not, from a medicinal point of view, an objectionable impurity; still I cannot recommend that the presence of chinchonidine in commercial sulphate of quinine should be sanctioned.

9. It is essential that chemical products furnished for medical purposes shall be pure and simple in their nature, and not variable mixtures of two or more similar substances, a condition which would open a door at once to wilful adul-

teration; for it is only when dealing with simple substances that ready tests can be given for ascertaining their purity.

10. If chinchonidine is really superior, or even equal, to quinine, let it be furnished in commerce pure, and under its proper name. I think that quinoidine deserves a special and extended trial, on account of its very low price of 2s. 9d. per pound.

11. With regard to the suggestion offered by Mr. Howard, that the plants should be encouraged, by peculiar treatment, to produce quinine rather than chinchonidine, I think there is a possibility of success in this direction. If we consider that under variable conditions of heat and light certain fruits will contain, sometimes quantities of acids, sometimes large quantities of sugar; that when common hemp grown in India becomes a powerful narcotic, while the seeds taken from that very hemp, grown in England, produces a plant destitute of narcotic property; that when the common potatoe, caused to vegetate in the absence of sunlight, develops a powerful poison (solanum), there is some hope that the products of *Chinchona* may be modified to useful purposes by judicious treatment.

12. Perhaps the experiences of vine growers might afford valuable hints as to the best methods of training plants, so as to secure the greatest yield of medically useful alkaloids.

13. I should say that the most practical proceeding would be to collect the whole alkaloid from one species, or from one species treated in a particular way, *quoad* manure, soil, light, elevation, &c., and compare the total yield of alkaloid per cent., and the therapeutical value of the whole product, with that obtained under different circumstances.

14. A commission of medical officers at each Presidency would be necessary, to examine and report on the comparative actions and uses of the several alkaloids thus prepared, in the treatment of the malarious fevers of India, remittent and intermittent, testing their efficacy especially in the fevers of the most notoriously unhealthy districts and stations.

15. Chinchonine has been found highly useful in the treatment of the milder marsh fevers of France and Italy; but it failed to cure the pernicious or malignant fevers of those countries. The same results would probably be obtained from the same trials in the East Indies.

To the Under Secretary of State for India,
India Office, London.

I have, &c.
(signed) *J. R. Martin.*

P. S.—For purposes of experiment and test, I think that the following quantities of the several alkaloids may prove sufficient for use, under direction of the proposed medical commissions at each Presidency:—

	<i>Lbs.</i>
For Bengal - - - - -	12
„ Madras - - - - -	8
„ Bombay - - - - -	6
	<i>J. R. M.</i>

— No. 55. —

From Mr. *Howard* to Mr. *Merivale*.

The Court, Wellington, Somerset,
3 October 1865.

Sir,

I HAVE the honour of acknowledging receipt through your hands of the thanks of the Secretary of State for India for my investigation of the *Chinchona* bark from the Neilgherry Hills; and, in reference to the inquiry in your letter, beg to state that I shall be happy to supply a sufficient quantity of the different *Chinchona* alkaloids specially prepared for the purpose of the medical commission.

It will be desirable that our firm, Howard and Sons, Stratford, E., should be informed in good time of the quantity of each alkaloid required, and also of the state in which each is to be sent, whether pure, or as sulphates, or muriates, or other state of combination. I may mention that the muriate of chinchonine is the form most convenient for dispensing, and the sulphates of the other alkaloids.

Herman Merivale, Esq.

I am, &c.
(signed) *John Eliot Howard.*

— No. 56 —

From Mr. Deedes to Sir Ranald Martin.

6 October 1865.

WITH reference to the request contained in the annexed letter from Mr. Howard, the Secretary in the Public Department will thank Sir Ranald Martin if he will acquaint him in what state, in his opinion, the Chinchona alkaloids should be transmitted to India, with any observations he may wish to make on Mr. Howard's letter.

Henry Deedes.

— No. 57. —

From Sir Ranald Martin to Mr. Deedes.

Sir,

37, Upper Brook-street, 8 October 1865.

ON the subject of Mr. Howard's letter, referred to me from the Public Department on the 6th instant, I beg leave to observe:

1. That the muriate of Chinchona may be an excellent preparation, and that this form of alkaloid may be the best for dispensing.

2. But we are here about to institute experiments of a comparative nature, and I think it very desirable that all the Chinchona alkaloids should be in the form of sulphates.

3. It might be objected hereafter that an experiment lost half its value because the quinine was a sulphate, while the chinchonine was a muriate.

On these grounds I would recommend that all the preparations be sulphates.

To Henry C. Deedes, Esq.,
Secretary, Public Department, India Office.

I have, &c.
(signed) J. R. Martin.

— No. 58. —

From Mr. Merivale to Messrs. Howard.

Gentlemen,

India Office, 13 October 1865.

WITH reference to Mr. J. E. Howard's letter of the 3rd instant, I am directed by the Secretary of State for India in Council, to inform you that it is thought most advisable that the alkaloids, for the investigation which it is proposed should be made into the Chinchona bark from the Neilgherry Hills, should be in the form of sulphates, and that the quantities of each should be in the proportion of—

	<i>Lbs.</i>
For Bengal - - - - -	12
„ Madras - - - - -	8
„ Bombay - - - - -	6

I am to request that you will have these chemicals properly packed and forwarded to the Director General of Stores, India Office, Cannon Row, Westminster, who will receive directions regarding their transmission to their several destinations.

Messrs. Howard and Sons,
Stratford, E.

I am, &c.,
(signed) Herman Merivale.

— No. 59. —

From Messrs. Howard to Mr. Merivale.

Sir,

Stratford, near London, 16 October 1865.

WE are in receipt of your favour of 13th instant, with instructions from the Secretary of State for India in Council, containing order for Chinchona alkaloids for Bengal, Madras, and Bombay, which we have put in hand, and which shall be executed with as little delay as possible. As, however, the articles have to be prepared with special care, some little time must necessarily elapse before they can be ready for delivery.

Herman Merivale, Esq.,
India Office, London.

We have, &c.
(signed) Howard and Sons.

— No. 60. —

From the Government of Madras to the Secretary of State for India.

Madras, 24 August 1865.

We have the honour to forward for your information the accompanying Tabular Report on the number, condition, &c., of the Chinchona plants on the Neilgherries on the 31st July 1865.

Enclosure in No. 60.

REPORT on the Number, Distribution, and Condition of Chinchona Plants on the Neilgherries, on 31 July 1865.

No. of Species.	Botanical Names.	Commercial Names.	Number of Plants.	Value per Lb. of Dry Bark in the London Market.		REMARKS.
				s. d.	s. d.	
1	<i>C. succirubra</i> - -	Red Bark - -	205,806	2 6	to 8 9	<p>The number of plants planted out during the month is 11,434, making the total permanently planted out in the plantations 2,05,678.</p> <p>The month has been very stormy from the 4th to the 13th, and the plants on the second Denison plantation have suffered considerably from the winds, especially the 11 plants planted out by his Excellency the Governor on the 30th August 1862.</p> <p>The assistant superintendent, in his anxiety to protect these plants from the storm, placed mats around them, which, escaping from their ties and flapping against the plants, cut and barked the branches, producing far greater injury than if the plants had been unprotected; they have, nevertheless, made an</p>
2	<i>C. Calisaya</i> , var. <i>fruticosa</i> , var. <i>vera</i> .	Yellow Bark - -	2,958	2 10	to 7 -	
3	<i>C. officinalis</i> , var. <i>Condemia</i> (<i>C. Uritusinga</i>).	Original Loxa Bark	7,974	2 10	to 7 -	
4	<i>C. officinalis</i> , var. <i>Bonplandiana</i> (<i>C. Chahuarguera</i>).	Select Crown Bark -	421,640	2 10	to 6 -	
5	<i>C. crespilla</i> - -	Fine Crown Bark - -	3,139	2 10	to 6 -	
6	<i>C. lancifolia</i> - -	Pitayo Bark - -	64	1 8	to 2 10	
7	<i>C. nitida</i> - -	Genuine Grey Bark	2,786	1 8	to 2 9	
8	<i>C. Species</i> without name.	Fine Grey Bark - -	8,500	1 8	to 2 10	
9	<i>C. micrantha</i> - -	Grey Bark - -	4,917	1 8	to 2 9	
10	<i>C. Peruviana</i> - -	Finest Grey Bark - -	3,889	1 8	to 2 10	
11	<i>C. Pahudiana</i> - -	Unknown - -	425	Unknown.		
TOTAL Number of Plants - - -			671,597			

average growth of $1\frac{2}{11}$ inches during the month, and they are now beginning to recover from the effects of the storm.

None of the plants on the first Denison or Markham plantations suffered materially from the effects of this storm, thus establishing the great importance of aspect for Chinchona cultivation. Some thousands of plants of the *C. succirubra* are now in full bloom, and present a very attractive appearance; also several plants of the *C. Calisaya*, *C. micrantha*, *C. Peruviana*, *C. nitida*, *C. officinalis* and its varieties we may therefore shortly expect an abundant supply of seeds of all the most valuable species.

The increase by propagation is 51,422, being 26,545 plants above the average of the last six months, making the total at the end of the month 6,71,597.

TABLE II.

MEMORANDUM of the Growth of Eleven Plants of *C. succirubra*, planted on the Second Denison Plantations, at Neddivuttum, on 30 August 1862.

Number of Plants.	Height in Inches when Planted on 30 August 1862.	Height in Inches on 30 June 1865.	Height in Inches on 31 July 1865.	Growth in Inches during July 1865.	By whom Planted.
1	23	121	122½	1½	<p>His Excellency Sir William Denison.</p> <p>J. W. Breeks, Esq. Dr. Sanderson. J. D. Sim, Esq. Lieutenant McLeod. P. Grant, Esq. Plant cut down for bark.</p>
2	16½	109	109½	½	
3	19	111	112	1	
4	15	103½	104½	½	
5	27	123	124½	1½	
6	20	98	99	1	
7	20	112½	113	½	
8	18	117	119	2	
9	20	117	119½	2½	
10	20	123	123½	½	
11	18	106½	108	1½	
12	-	64½	68½	3½	

TABLE II. exhibits the growth of 11 plants of *C. succirubra* planted out by his Excellency the Governor and other gentlemen, at Neddivuttum, on the 30th August 1862. The average growth of these plants during the month is $1\frac{2}{11}$ inches, being $2\frac{2}{11}$ inches under the growth of last month.

One of the two plants cut down on the 20th March 1863, for the bark submitted to Mr. Howard for analysis, has made strong shoots of 68½ inches in height, giving the growth of 3½ inches during the month.

TABLE III.—SHOWING the Height of Twelve Plants of *C. officinalis*, planted on the Dodabetta Plantation, at Ootacamund, on 30 September 1863.

Number of Plants.	Height in Inches when Planted on 30 September 1863.	Height in Inches on 30 June 1865.	Height in Inches on 31 July 1865.	Growth in Inches during July 1865.	REMARKS.
1	19	84	88	4	The 12 plants of <i>C. officinalis</i> (a shrubby species) on the Dodabetta plantation gives an average growth of $3\frac{1}{2}$ inches, or $\frac{1}{3}$ of an inch above the growth of last month.
2	14 $\frac{1}{2}$	79	83 $\frac{1}{2}$	4 $\frac{1}{2}$	
3	28	86	89	3	
4	22	87	88 $\frac{1}{2}$	1 $\frac{1}{2}$	
5	21 $\frac{1}{2}$	86 $\frac{1}{2}$	89	3 $\frac{1}{2}$	
6	28	97 $\frac{1}{2}$	102	4 $\frac{1}{2}$	
7	22 $\frac{1}{2}$	84	87	3	
8	21 $\frac{1}{2}$	81	84 $\frac{1}{2}$	3 $\frac{1}{2}$	
9	21 $\frac{1}{2}$	90 $\frac{1}{2}$	94	3 $\frac{1}{2}$	
10	19 $\frac{1}{2}$	84 $\frac{1}{2}$	87	2 $\frac{1}{2}$	
11	24	89	93	4	
12	24	87 $\frac{1}{2}$	91	3 $\frac{1}{2}$	

TABLE IV.—REGISTER of Chinchona Plants Distributed.

NAMES.	STATION.	Number of Plants.
Mr. F. N. Maltby	Travancore	16
Dr. Junghuhn	Java	56
Mr. A. R. Lascelles	Ootacamund	12
Mr. M. Anderson	Jamaica	2
Dr. Wiche	Bombay	10
Dr. T. Anderson	Calcutta	554
Dr. Jamieson	Saharanpore	107
Professor Lees	Calcutta	547
Rajah of Travancore	Travancore	521
Major Morgan	Ootacamund	1,534
Mr. E. T. Fitzgerald	Calcutta	558
Mr. J. W. B. Money	ditto	1,369
Dr. W. Bourne	ditto	532
Captain Cox	Wynad	6
Mr. Hollock	ditto	2
Mr. T. Sheffield	Ootacamund	12
Dr. F. Day	Cochin	100
Mr. Brown	Tellicherry	12
Mr. J. Hall	Ootacamund	144
Mr. J. Knop	ditto	18
Captain Lees	Bengal	281
Mr. W. H. Rayne	Manantoddy	424
Rev. — Sawyer	Ootacamund	1,018
Mr. Frend	ditto	512
Mr. Hollock	ditto	1
Mr. J. Pierie	Seegoor	12
Colonel Scott	Ootacamund	1,236
Mr. Berend	Cachar	275
Rev. J. Hunter	Coonoor	12
Mr. J. Mullaly	ditto	24
Mr. W. H. Stanes	ditto	1,262
Colonel R. Cooper	Kotagherry	12
Mr. F. Cockburn	ditto	12
Colonel Woodfall	Coonoor	12
Mr. C. Anderson	ditto	24
Colonel Angelo	Ootacamund	12
Rev. E. Laseron	ditto	12
Captain R. N. Taylor	Coorg	96
Major W. Agnew	Assam	139
Mr. V. H. Levinge	Madura	12
Chief Commissioner of	Nagpore	28
Mr. Fletcher	Ootacamund	24
Gool Mahomed	ditto	20
General McCleverty	New Zealand	23
Mr. W. Robinson	Kotagherry	30

The number of plants issued to the public during the month, is 1,665, making the total number of plants distributed, 80,898.

It is worthy of remark, that during the heaviest storms none of the older plants have been blown down, as they obtain great support from the dense mass of fibrous roots they produce.

TABLE IV.—Register of Chinchona Plants Distributed—*continued.*

NAMES.	STATION.	Number of Plants.	REMARKS.
Mr. Crake	Wynad	12	
Mr. H. R. Dawson	Seegor	12	
Captain Mann	Coorg	48	
Mr. E. Roberts	- ditto	580	
Mr. H. Russell	Wynad	12	
Rev. Wait	Coonoor	2	
Collector of Belgaum	Belgaum	28	
Collector of Honore	Honore	28	
Dr. Ross	- ditto	15	
His Excellency the Governor	Bombay	158	
Mr. H. Hinde	Wynad	12	
Mr. E. B. Thomas	Coonoor	12	
Rajah of Poonganoor	Poonganoor	12	
Major Grant	Wellington	226	
Messrs. Thomson, Shaw & Co.	Poonganoor	28	
Mr. J. H. Trinson	- ditto	31	
Dr. Muller	Melbourne	28	
Mr. Tyrrell	Mysore	12	
Dr. Sayers	Vellore	12	
Major C. P. Taylor	Ootacamund	5,250	
Doctor Wilson	- ditto	6	
Mr. Schnarrie	- ditto	15,000	
Captain Fuller	Coonoor	417	
Dr. Drummond	Ootacamund	224	
Captain Jennings	- ditto	1,756	
Lieut. H. B. Montmorency	Bangalore	6	
Mr. McHutchin	Ootacamund	3	
Colonel Molesworth	- ditto	6	
Mr. C. Gray	Coonoor	12	
Mr. H. B. Leddell	Ootacamund	12	
M. Minchin	Wynad	1,600	
His Excellency the Governor	Vizagapatam	35	
Mr. R. F. Phillips	Kotagherry	1,117	
Colonel Cooke	- ditto	24	
Mr. G. J. Glaason	Wynad	1,000	
Dr. Macpherson	Mercara	400	
Mr. W. H. Kerr	Coorg	3,100	
Mr. James	Ootacamund	1,000	
Colonel Whish	Bengal	82	
Mr. K. Mair	Calcutta	1,180	
Mr. W. Shakespear	- ditto	61	
Mr. E. E. Meakin	- ditto	168	
Mr. C. Ackland	- ditto	150	
Mr. K. McIver	- ditto	124	
Mr. Havelock	Ootacamund	12	
Mr. H. de Facien	Kartairy	6,821	
Major Sweet	- ditto	102	
Captain Campbell	Bangalore	6	
Royal Gardens	Mauritius	86	
Hon. W. R. Arbuthnot	Wynad	93	
Mr. H. Maxwell	Bombay	50	
Mrs. C. Smith	Wynad	22	
Captain Beckley	Wellington	200	
Mr. Walsh	Salem	100	
His Excellency the Governor General	Java	175	
Captain Richardson	Kulhatty	381	
Rajah of Poonganoor	Poonganoor	24	
His Excellency the Governor	Madras	24	
Mr. J. W. B. Money	Ootacamund	25,000	
Captain Mitcheson	- ditto	50	
Mr. R. H. Elliot	Nunjerabad	157	
His Excellency the Governor General	Goa	252	
Colonel Phayre	Rangoon	152	
Mr. Ryall	Kotagherry	24	
Mr. J. Gordon	Coonoor	1,529	
Mr. J. Rohde	Neddivuttum	100	
Mr. J. Higginbotham	Goodaloor	12	
TOTAL Number of Plants		80,898	

Ootacamund,
12 August 1865.

(signed) *W. G. McIvor,*
Superintendent Government Chinchona Plantations.

— No. 61. —

From the Government of Madras to the Secretary of State for India.

Madras, 23 September 1865.

We have the honour to forward for your information the accompanying Tabular Report on the number, condition, &c. of the Chinchona plants on the Neilgherries on the 31st August 1865.

Enclosure in No. 61.

REPORT on the Number, Distribution, and Condition of Chinchona Plants on the Neilgherries, on 31 August 1865.

No. of Species.	Botanical Names.	Commercial Names.	Number of Plants.	Value per Lb. of Dry Bark in the London Market.		REMARKS.
				s. d.	s. d.	
1	<i>C. succirubra</i> - -	Red Bark - -	2,14,948	2 6	to 8 9	The number of plants planted out during the month is 39,193; making the total permanently planted out in the plantations 2,44,871. The increase by propagation is 25,424, being 5,125 plants under the average of the last six months, making the total at the end of the month 6,96,853.
2	<i>C. Calisaya</i> , var. frutex, var. vera.	Yellow Bark - -	3,158	2 10	to 7 -	
3	<i>C. officinalis</i> , var. Condamenia (<i>C. Uritusinga</i>).	Original Loxa Bark	8,559	2 10	to 7 -	
4	<i>C. officinalis</i> , var. Bonplandiana (<i>C. Chahuarguara</i>).	Select Crown Bark -	4,36,962	2 10	to 7 -	
5	<i>C. crespilla</i> - -	Fine Crown Bark - -	3,139	2 10	to 6 -	
6	<i>C. lancifolia</i> - -	Pitayo Bark - -	93	1 8	to 2 10	
7	<i>C. nitida</i> - -	Genuine Grey Bark	2,786	1 8	to 2 9	
8	<i>C. Species without name.</i>	Fine Grey Bark - -	8,500	1 8	to 2 10	
9	<i>C. micrantha</i> - -	Grey Bark - -	14,899	1 8	to 2 9	
10	<i>C. Peruviana</i> - -	Finest Grey Bark -	3,389	1 8	to 2 10	
11	<i>C. Pahudiana</i> - -	Unknown - -	425	Unknown.		
TOTAL Number of Plants - - -			6,96,853			

TABLE II.

MEMORANDUM of the Growth of Eleven Plants of *C. succirubra*, planted on the 2d Denison Plantation, at Nedddivuttum, on 30 August 1862.

Number of Plants.	Height in Inches when Planted on 30 August 1862.	Height in Inches on 31 July 1865.	Height in Inches on 31 August 1865.	Growth in Inches during August 1865.	By whom Planted.
1	23	122½	124	1½	His Excellency Sir W. Denison. J. W. Brecks. Esq. Dr. Sanderson. J. D. Sim, Esq. Lieutenant McLeod. P. Grant, Esq. Plant cut down for bark
2	16½	109½	110½	½	
3	19	112	113	1	
4	15	104½	105	½	
5	27	124½	125½	1	
6	29	99	100	1	
7	20	113	113½	½	
8	18	119	120	1	
9	20	119½	121	1½	
10	20	123½	124½	½	
11	18	108	109	1	
12	-	68½	70½	2½	

TABLE II. exhibits the growth of eleven plants of *C. succirubra* planted out by his Excellency the Governor and other gentlemen, at Nedddivuttum, on the 30th August 1862. The average growth of these plants during the month is 1 inch, being $\frac{2}{11}$ of an inch under the growth of last month.

One of the two plants cut down on the 20th of March 1863, for the bark submitted to Mr. Howard for analysis, has made strong shoots of 70½ inches in height, giving the growth of 2½ inches during the month.

TABLE III.

SHOWING the Height of Twelve Plants of *C. officinalis*, planted on the Dodabetta Plantation, at Ootacamund, on 30 September 1863.

Number of Plants.	Height in Inches when Planted, on 30 September 1863.	Height in Inches on 31 July 1865.	Height in Inches on 31 August 1865.	Growth in Inches during August 1865.	REMARKS.
1	19	88	92½	4½	The 12 plants of <i>C. officinalis</i> (a shrubby species) on the Dodabetta plantation, gives an average growth of 3¾ inches, or ¼ of an inch above the growth of last month.
2	14½	83½	86	2½	
3	28	89	94½	5½	
4	22	88½	90½	2	
5	21½	89	93½	4½	
6	28	102	105½	3½	
7	22½	87	89½	2½	
8	21½	84½	87½	3	
9	21½	94	97½	3½	
10	19½	87	90½	3½	
11	24	93	97	4	
12	24	91	96	5	

TABLE IV.

REGISTER of Chinchona Plants Distributed.

NAMES.	STATION.	Number of Plants.
Mr. F. N. Maltby - - - -	Travancore - - - -	16
Dr. Junghuhn - - - -	Java - - - -	56
Mr. A. R. Lascelles - - - -	Ootacamund - - - -	12
Mr. M. Anderson - - - -	Jamaica - - - -	2
Dr. Wiche - - - -	Bombay - - - -	10
Dr. T. Anderson - - - -	Calcutta - - - -	554
Dr. Jamieson - - - -	Saharanpore - - - -	107
Professor Lees - - - -	Calcutta - - - -	547
Rajah of Travancore - - - -	Travancore - - - -	521
Major Morgan - - - -	Ootacamund - - - -	1,534
Mr. E. T. Fitzgerald - - - -	Calcutta - - - -	558
Mr. J. W. B. Money - - - -	- ditto - - - -	1,369
Mr. W. Bourne - - - -	- ditto - - - -	532
Captain Cox - - - -	Wynad - - - -	6
Mr. Hollock - - - -	- ditto - - - -	2
Mr. T. Sheffield - - - -	Ootacamund - - - -	12
Dr. F. Day - - - -	Cochin - - - -	100
Mr. Brown - - - -	Tellicherry - - - -	12
Mr. J. Hall - - - -	Ootacamund - - - -	144
Mr. T. Knop. - - - -	- ditto - - - -	18
Captain Lees - - - -	Bengal - - - -	281
Mr. W. H. Rayne - - - -	Manantoddy - - - -	424
Rev. — Sawyer - - - -	Ootacamund - - - -	1,018
Mr. Friend - - - -	- ditto - - - -	512
Mr. Hollock - - - -	- ditto - - - -	1
Mr. J. Pierie - - - -	Seegoor - - - -	12
Colonel Scott - - - -	Ootacamund - - - -	1,236
Mr. Berend - - - -	Cachar - - - -	275
Rev. J. Hunter - - - -	Coonoor - - - -	12
Mr. J. Mullaly - - - -	- ditto - - - -	24
Mr. W. H. Stanes - - - -	- ditto - - - -	1,262
Colonel R. Cooper - - - -	Kotagherry - - - -	12
Mr. F. Cockburn - - - -	- ditto - - - -	12
Colonel Woodfall - - - -	Coonoor - - - -	12
Mr. C. Anderson - - - -	- ditto - - - -	24
Colonel Angelo - - - -	Ootacamund - - - -	12
Rev. E. Lason - - - -	- ditto - - - -	12
Captain R. N. Taylor - - - -	Coorg - - - -	96
Major W. Agnew - - - -	Assam - - - -	139
Mr. V. H. Levinge - - - -	Madura - - - -	12
Chief Commissioner of - - - -	Nagpore - - - -	28
Mr. Fletcher - - - -	Ootacamund - - - -	24
Gool Mahomed - - - -	- ditto - - - -	20
General McCleverty - - - -	New Zealand - - - -	28
Mr. W. Robinson - - - -	Kotagherry - - - -	30
Mr. Crake - - - -	Wynad - - - -	12
Mr. H. R. Dawson - - - -	Seegoor - - - -	12

The number of plants issued to the public during the month is 168, making the total number of plants distributed 81,066.

TABLE IV.—Register of Chinchona Plants Distributed—*continued*.

NAMES.	STATION.	Number of Plants.	REMARKS.
Captain Mann	Coorg	48	
Mr. E. Roberts	- ditto	580	
Mr. H. Russell	Wynad	12	
Reverend — Wait-	Coonoor	2	
Collector of Belgaum	Belgaum	28	
Collector of Honore	Honore	28	
Dr. Ross	- ditto	15	
His Excellency the Governor	Bombay	158	
Mr. H. Hinde	Wynad	12	
" E. B. Thomas	Coonoor	12	
Rajah of Poonganoor	Poonganoor	12	
Major Grant	Wellington	226	
Messrs. Thomson, Shaw & Co.	Poonganoor	28	
Mr. J. H. Trinson	- ditto	31	
Dr. Muller	Melbourne	28	
Mr. Tyrrell	Mysore	12	
Dr. Sayers	Vellore	12	
Major C. P. Taylor	Ootacamund	5,250	
Doctor Wilson	- ditto	6	
Mr. Schnarrie	- ditto	15,000	
Captain Fuller	Coonoor	417	
Dr. Drummond	Ootacamund	224	
Captain Jennings	- ditto	1,756	
Lieut. H. B. Montmorency	Bangalore	6	
Mr. M. Hutchin	Ootacamund	3	
Colonel Molesworth	- ditto	6	
Mr. C. Gray	Coonoor	12	
" H. B. Leddell	Ootacamund	12	
" Minchin	Wynad	1,600	
His Excellency the Governor	Vizagapatam	35	
Mr. R. F. Phillips	Kotagherry	1,117	
Colonel Cooke	- ditto	24	
Mr. G. J. Glasson	Wynad	1,000	
Dr. Macpherson	Mercara	400	
Mr. W. H. Kerr	Coorg	3,100	
" James	Ootacamund	1,000	
Colonel Whish	Bengal	82	
Mr. K. Mair	Calcutta	1,180	
" W. Shakespear	- ditto	61	
" E. E. Meakin	- ditto	168	
" C. Ackland	- ditto	150	
" K. M. Iver	- ditto	124	
" Havelock	Ootacamund	12	
" H. de Facien	Kartairy	6,821	
Major Sweet	- ditto	102	
Captain Campbell	Bangalore	6	
Royal Gardens	Mauritius	36	
Honourable W. R. Arbuthnot	Wynad	93	
Mr. H. Maxwell	Bombay	50	
Mrs. C. Smith	Wynad	22	
Captain Beckley	Wellington	200	
Mr. Walsh	Salem	100	
His Excellency the Governor General	Java	175	
Captain Richardson	Kulhatty	381	
Rajah of Poonganoor	Poonganoor	24	
His Excellency the Governor	Madras	24	
Mr. J. W. B. Money	Ootacamund	25,000	
Captain Mitcheson	- ditto	50	
Mr. R. H. Elliot	Munjerabad	157	
His Excellency the Governor General	Goa	252	
Colonel Phayre	Rangoon	152	
Mr. Ryall	Kotagherry	24	
" J. Gordon	Coonoor	1,529	
" J. Rohde	Neddivuttam	100	
" J. Higginbotham	Goodaloor	12	
" S. Pitol	Mauritius	36	
" J. Horne	- ditto	36	
M. Edouard Cremary	Reunion	51	
For the French Government	Algiers	45	
TOTAL Number of Plants		81,066	

Ootacamund,
September 1865.(signed) W. G. McIvor,
Superintendent, Government Chinchona Plantations.

— No. 62. —

From the Government of Madras to the Secretary of State in Council.

Madras, 26 October 1865.

WE have the honour to forward, for your information, the accompanying Tabular Report on the number, condition, &c., of the Chinchona plants on the Neilgherries, on the 30th September 1865.

Enclosure in No 62.

REPORT on the Number, Distribution, and Condition of Chinchona Plants on the Neilgherries, on the 30th September 1865.

No. of Species.	Botanical Names.	Commercial Names.	Number of Plants.	Value per Lb. of Dry Bark in the London Market.	REMARKS.
1	<i>C. succirubra</i> - -	Red Bark - -	221,280	<i>s. d.</i> 2 6 to <i>s. d.</i> 8 9	<p>The number of plants planted out in the plantation remain the same as in last month, namely, 244,871.</p> <p>The increase by propagation is 78,725, being 37,815 plants above the average of the last six months, making the total number of plants 775,153.</p>
2	<i>C. calisaya</i> , var. <i>Fru-tex</i> , var. <i>Vera</i> .	Yellow Bark - -	3,138	2 10 to 7 -	
3	<i>C. officinalis</i> , var. <i>Con-damenia</i> (<i>C. Uritu-singa</i>).	Original Loxa Bark	8,489	2 10 to 7 -	
4	<i>C. officinalis</i> , var. <i>Bon-plandiana</i> (<i>C. Cha-huarguera</i>).	Select Crown Bark -	509,021	2 10 to 7 -	
5	<i>C. crespilla</i> - -	Fine Crown Bark - -	3,139	2 10 to 6 -	
6	<i>C. lancifolia</i> - -	Pitayo Bark - -	98	1 8 to 2 10	
7	<i>C. nitida</i> - -	Genuine Grey Bark	2,786	1 8 to 2 9	
8	<i>C. Species</i> without name.	Fine Grey Bark - -	8,500	1 8 to 2 10	
9	<i>C. micrantha</i> - -	Grey Bark - -	14,893	1 8 to 2 9	
10	<i>C. Peruviana</i> - -	Finest Grey Bark - -	3,389	1 8 to 2 10	
11	<i>C. Pahudiana</i> - -	Unknown - -	425	Unknown.	
TOTAL Number of Plants: - - -			775,153		

TABLE II.

MEMORANDUM of the Growth of Eleven Plants of *C. succirubra*, planted on the Second Denison Plantation at Nedddivuttum, on the 30th August 1862.

Number of Plants.	Height in Inches when Planted, 30 August 1862.	Height in Inches on 31 August 1865.	Height in Inches on 30 September 1865.	Growth in Inches during Sept. 1865.	By Whom Planted.
1	23	124	125½	1½	<p>His Excellency Sir W. Denison.</p> <p>J. W. Breeks, Esq. Dr. Sanderson. J. D. Sim, Esq. Lieutenant M'Leod. P. Grant, Esq. Plant cut down for bark.</p>
2	16½	110½	111½	1	
3	19	113	114½	1½	
4	15	105	105½	½	
5	27	125½	126½	1½	
6	20	100	102	2	
7	20	113½	114½	1	
8	18	120	121	1	
9	20	121	121½	½	
10	20	124½	125½	1	
11	18	109	109½	½	
12	-	70½	72	1½	

TABLE II. exhibits the growth of 11 plants of *C. succirubra* planted out by his Excellency the Governor, and other gentlemen, at Nedddivuttum, on the 30th August 1862. The average growth of these plants during the month is the same as in last month, viz., 1½ inch.

One of the two plants cut down on the 20th March 1863 for the bark submitted to Mr. Howard for analysis, has made strong shoots of 72 inches in height, giving the growth of 1½ inch during the month.

TABLE III.

SHOWING the Height of Twelve Plants of *C. officinalis*, planted on the Dodabetta Plantation at Ootacamund, on the 30th September 1863.

Number of Plants.	Height in Inches when Planted, 30 September 1863.	Height in Inches on 31 August 1865.	Height in Inches on 30 September 1865.	Growth in Inches during September 1865.	REMARKS.
1	19	92½	96	3½	The 12 plants of <i>C. officinalis</i> (a shrubby species) on the Dodabetta plantation, gives an average growth of 3½ inches, or about half an inch under the growth of last month.
2	14½	86	89	3	
3	28	94½	97	2½	
4	22	90½	93½	3	
5	21½	98½	97	3½	
6	28	105½	109½	4	
7	22½	89½	92	2½	
8	21½	87½	90½	3	
9	21½	97½	101	3½	
10	19½	90½	94	3½	
11	24	97	100	3	
12	24	96	99½	3½	

TABLE IV.

REGISTER of Chinchona Plants Distributed.

NAMES.	STATION.	Number of Plants.
Mr. F. N. Maltby - - - -	Travancore - - - -	16
Dr. Junghuhn - - - -	Java - - - -	58
Mr. A. R. Lascelles - - - -	Ootacamund - - - -	12
Mr. M. Anderson - - - -	Jamaica - - - -	2
Dr. Wiche - - - -	Bombay - - - -	10
Dr. T. Anderson - - - -	Calcutta - - - -	554
Dr. Jamieson - - - -	Saharanpore - - - -	107
Professor Lees - - - -	Calcutta - - - -	547
Rajah of Travancore - - - -	Travancore - - - -	521
Major Morgan - - - -	Ootacamund - - - -	1,584
Mr. E. T. Fitzgerald - - - -	Calcutta - - - -	558
Mr. J. W. B. Money - - - -	ditto - - - -	1,369
Mr. W. Bourne - - - -	ditto - - - -	532
Captain Cox - - - -	Wynad - - - -	6
Mr. Hollock - - - -	ditto - - - -	2
Mr. T. Sheffield - - - -	Ootacamund - - - -	12
Dr. F. Day - - - -	Cochin - - - -	100
Mr. Brown - - - -	Tellicherry - - - -	12
Mr. J. Hall - - - -	Ootacamund - - - -	144
Mr. T. Knop - - - -	ditto - - - -	18
Captain Lees - - - -	Bengal - - - -	281
Mr. W. H. Rayne - - - -	Manantoddy - - - -	424
Rev. — Sawyer - - - -	Ootacamund - - - -	1,018
Mr. Frend - - - -	ditto - - - -	512

The number of plants issued to the public during the month is 425, making the total number of plants distributed 81,491.

TABLE IV.—Register of Chinchona Plants Distributed—*continued.*

NAMES.	STATION.	Number of Plants.	REMARKS.
Mr. Hollock - - - -	Ootacamund - - -	1	
Mr. J. Pierie - - - -	Seegoor - - - -	12	
Colonel Scott - - - -	Ootacamund - - -	1,236	
Mr. Berend - - - -	Cachar - - - -	275	
Rev. J. Hunter - - - -	Coonoor - - - -	12	
Mr. J. Mullaly - - - -	ditto - - - -	24	
Mr. W. H. Stanes - - - -	ditto - - - -	1,262	
Colonel R. Cooper - - - -	Kotagherry - - -	12	
Mr. F. Cockburn - - - -	ditto - - - -	12	
Colonel Woodfall - - - -	Coonoor - - - -	12	
Mr. C. Anderson - - - -	ditto - - - -	24	
Colonel Angelo - - - -	Ootacamund - - -	12	
Rev. E. Laseron - - - -	ditto - - - -	12	
Captain R. N. Taylor - - - -	Coorg - - - -	96	
Major W. Agnew - - - -	Assam - - - -	139	
Mr. V. H. Levinge - - - -	Madura - - - -	12	
Chief Commissioner of - - - -	Nagpore - - - -	28	
Mr. Fletcher - - - -	Ootacamund - - -	24	
Gool Mahomed - - - -	ditto - - - -	20	
General M'Cleverty - - - -	New Zealand - - -	28	
Mr. W. Robinson - - - -	Kotagherry - - -	30	
Mr. Crake - - - -	Wynad - - - -	12	
Mr. H. R. Dawson - - - -	Seegoor - - - -	12	
Captain Mann - - - -	Coorg - - - -	48	
Mr. E. Roberts - - - -	ditto - - - -	530	
Mr. H. Russell - - - -	Wynad - - - -	12	
Reverend — Wait - - - -	Coonoor - - - -	2	
Collector of Belgaum - - - -	Belgaum - - - -	28	
Collector of Honore - - - -	Honore - - - -	28	
Dr. Ross - - - -	ditto - - - -	15	
His Excellency the Governor - - - -	Bombay - - - -	158	
Mr. H. Hinde - - - -	Wynad - - - -	12	
Mr. E. B. Thomas - - - -	Coonoor - - - -	12	
Rajah of Poonganoor - - - -	Poonganoor - - -	12	
Major Grant - - - -	Wellington - - -	226	
Messrs. Thomson, Shaw & Co. - - - -	Poonganoor - - -	28	
Mr. J. H. Trinson - - - -	ditto - - - -	31	
Dr. Muller - - - -	Melbourne - - -	28	
Mr. Tyrrell - - - -	Mysore - - - -	12	
Dr. Sayers - - - -	Vellore - - - -	12	
Major C. P. Taylor - - - -	Ootacamund - - -	5,250	
Dr. Wilson - - - -	ditto - - - -	6	
Mr. Schnarrie - - - -	ditto - - - -	15,000	
Captain Fuller - - - -	Coonoor - - - -	417	
Dr. Drummond - - - -	Ootacamund - - -	224	
Captain Jennings - - - -	ditto - - - -	1,756	
Lieut. H. B. Montmorency - - - -	Bangalore - - -	6	
Mr. M'Hutchin - - - -	Ootacamund - - -	3	
Colonel Molesworth - - - -	ditto - - - -	6	
Mr. C. Gray - - - -	Coonoor - - - -	12	
Mr. H. B. Leddell - - - -	Ootacamund - - -	12	
Mr. Minchin - - - -	Wynad - - - -	1,600	
His Excellency the Governor - - - -	Vizagapatam - - -	35	
Mr. R. F. Phillips - - - -	Kotagherry - - -	1,117	
Colonel Cooke - - - -	ditto - - - -	24	
Mr. G. J. Glasson - - - -	Wynad - - - -	1,000	
Dr. Macpherson - - - -	Mercara - - - -	400	
Mr. W. H. Kerr - - - -	Coorg - - - -	3,100	
Mr. James - - - -	Ootacamund - - -	1,000	

TABLE IV.—Register of Chinchona Plants Distributed—*continued*.

NAMES.	STATION.	Number of Plants.	REMARKS.
Colonel Whish - - - -	Bengal - - - -	82	
Mr. K. Mair - - - -	Calcutta - - - -	1,180	
Mr. W. Shakespear - - - -	ditto - - - -	61	
Mr. E. E. Meakin - - - -	ditto - - - -	168	
Mr. C. Ackland - - - -	ditto - - - -	150	
Mr. K. M'Iver - - - -	ditto - - - -	124	
Mr. Havelock - - - -	Ootacamund - - - -	12	
Mr. H. de Facien - - - -	Kartairy - - - -	6,821	
Major Sweet - - - -	ditto - - - -	102	
Captain Campbell - - - -	Bangalore - - - -	6	
Royal Gardens - - - -	Mauritius - - - -	36	
Honourable W. R. Arbuthnot - - - -	Wynad - - - -	98	
Mr. H. Maxwell - - - -	Bombay - - - -	50	
Mrs. C. Smith - - - -	Wynad - - - -	22	
Captain Beckley - - - -	Wellington - - - -	200	
Mr. Walsh - - - -	Salem - - - -	100	
His Excellency the Governor General - - - -	Java - - - -	175	
Captain Richardson - - - -	Kulhatty - - - -	381	
Rajah of Poonganoor - - - -	Poonganoor - - - -	24	
His Excellency the Governor - - - -	Madras - - - -	24	
Mr. J. W. B. Money - - - -	Ootacamund - - - -	25,000	
Captain Mitcheson - - - -	ditto - - - -	50	
Mr. R. H. Elliot - - - -	Munjerabad - - - -	157	
His Excellency the Governor General - - - -	Goa - - - -	252	
Colonel Phayre - - - -	Rangoon - - - -	152	
Mr. Ryall - - - -	Kotagherry - - - -	24	
Mr. J. Gordon - - - -	Coonoor - - - -	1,579	
Mr. J. Rohde - - - -	Neddivuttum - - - -	100	
Mr. J. Higginbotham - - - -	Goodaloor - - - -	12	
Mr. S. Pitol - - - -	Mauritius - - - -	36	
Mr. J. Horne - - - -	ditto - - - -	36	
M. Edward Cremary - - - -	Reunion - - - -	61	
For the French Government - - - -	Algiers - - - -	45	
Mr. J. B. Norton - - - -	Shevaroy's - - - -	50	
Mr. T. H. Rossall - - - -	Wynad - - - -	40	
Mr. Mackay - - - -	Punjab - - - -	50	
Mr. W. Forsyth - - - -	Central Provinces - - - -	169	
Colonel Cadell - - - -	Coorg - - - -	62	
Mr. J. L. Browning - - - -	Wynad - - - -	4	
TOTAL Number of Plants - - - -		81,491	

Ootacamund,
18 October 1865.

(signed) *W. G. McIvor*,
Superintendent, Government Chinchona Plantations.

— No. 63. —

From the Government of Madras to the Secretary of State for India.

Madras, 27 November 1865.

We have the honour to forward, for your information, the accompanying Tabular Report on the number, condition, &c., of the Chinchona plants on the Neilgherries, on the 31st October 1865.

Enclosure in No. 63.

REPORT on the Number, Distribution, and Condition of Chinchona Plants on the Neilgherries, on the 31st October 1865.

No. of Species.	Botanical Names.	Commercial Names.	Number of Plants.	Value per Lb. of Dry Bark in the London Market.		REMARKS.
				s. d.	s. d.	
1	<i>C. succirubra</i> - -	Red Bark - -	249,054	2 6	to 8 9	The number of plants planted out in the plantations remain the same as last month, namely, 244,871. The increase by propagation is 78,715, being 37,501 above the average of the last six months, making the total number of plants 863,550.
2	<i>C. calisaya</i> , var. Frutex, var. Vera.	Yellow Bark - -	3,156	2 10	to 7 -	
3	<i>C. officinalis</i> , var. Condamenia (<i>C. Uritusinga</i>).	Original Loxa Bark	8,489	2 10	to 7 -	
4	<i>C. officinalis</i> , var. Bonplandiana (<i>C. Chahuarguera</i>).	Select Crown Bark -	559,081	2 10	to 7 -	
5	<i>C. crespilla</i> - -	Fine Crown Bark - -	8,649	2 10	to 6 -	
6	<i>C. lancifolia</i> - -	Pitayo Bark - -	128	1 8	to 2 10	
7	<i>C. nitida</i> - -	Genuine Grey Bark	2,786	1 8	to 2 9	
8	<i>C. Species without name.</i>	Fine Grey Bark - -	8,500	1 8	to 2 10	
9	<i>C. micrantha</i> - -	Grey Bark - -	14,898	1 8	to 2 9	
10	<i>C. Peruviana</i> - -	Finest Grey Bark -	3,889	1 8	to 2 10	
11	<i>C. Pahudiana</i> - -	Unknown - -	425	Unknown.		
TOTAL Number of Plants - - -			853,550			

TABLE II.

MEMORANDUM of the Growth of Eleven Plants of *C. succirubra*, planted on the Second Denison Plantation at Neddivuttum, on the 30th August 1862.

Number of Plants.	Height in Inches when Planted, 30 August 1862.	Height in Inches on 30 September 1865.	Height in Inches on 31 October 1865.	Growth in Inches during October 1865.	By whom Planted.
1	23	125½	129	3½	His Excellency Sir W. Denison. J. W. Brecks, Esq. Dr. Sanderson. J. D. Sim, Esq. Lieutenant M'Leod. P. Grant, Esq. Plant cut down for bark.
2	16½	111½	114	2½	
3	19	114½	114½	-	
4	15	105½	109	3½	
5	27	126½	132	5½	
6	20	102	106½	4½	
7	20	114½	118	3½	
8	18	121	123	2	
9	20	121½	127	5½	
10	20	125½	127½	1½	
11	18	109½	110½	½	
12	-	72	76½	4½	

TABLE II. exhibits the growth of 11 plants of *C. succirubra* planted out by his Excellency the Governor, and other gentlemen, at Neddivuttum, on the 30th August 1862. The average growth of these plants during the month is near 3 inches, or 1¼ inch above that of last month.

One of the two plants cut down on the 20th of March 1863 for the bark submitted to Mr. Howard for analysis, has made strong shoots of 76½ inches in height, giving the growth of 4½ inches during the month.

TABLE III.

SHOWING the Height of Twelve Plants of *C. officinalis*, planted on the Dodabetta Plantation at Ootacamund, on the 30th September 1863.

Number of Plants.	Height in Inches when Planted, 30 September 1863.	Height in Inches on 30 September 1865.	Height in Inches on 31 October 1865.	Growth in Inches during October 1865.	REMARKS.
1	19	96	100	4	The 12 plants of <i>C. officinalis</i> (a shrubby species) on the Dodabetta Plantation, gives an average growth of $3\frac{1}{2}$ inches, or $\frac{1}{3}$ ths of an inch above the growth of last month.
2	14 $\frac{1}{2}$	89	91 $\frac{1}{2}$	2 $\frac{1}{2}$	
3	28	97	101	4	
4	22	93 $\frac{1}{2}$	97	3 $\frac{1}{2}$	
5	21 $\frac{1}{2}$	97	99 $\frac{1}{2}$	2 $\frac{1}{2}$	
6	28	109 $\frac{1}{2}$	113 $\frac{1}{2}$	4	
7	22 $\frac{1}{2}$	92	95 $\frac{1}{2}$	3 $\frac{1}{2}$	
8	21 $\frac{1}{2}$	90 $\frac{1}{2}$	94 $\frac{1}{2}$	4	
9	21 $\frac{1}{2}$	101	105	4	
10	19 $\frac{1}{2}$	94	98 $\frac{1}{2}$	4 $\frac{1}{2}$	
11	24	100	103 $\frac{1}{2}$	3 $\frac{1}{2}$	
12	24	99 $\frac{1}{2}$	102 $\frac{1}{2}$	3	

TABLE IV.

REGISTER of Chinchona Plants Distributed.

NAMES.	STATION.	Number of Plants.
Mr. F. N. Maltby - - - -	Travancore - - - -	16
Dr. Junghuhn - - - -	Java - - - -	56
Mr. A. R. Lascelles - - - -	Ootacamund - - - -	12
Mr. M. Anderson - - - -	Jamaica - - - -	2
Dr. Wiche - - - -	Bombay - - - -	10
Dr. T. Anderson - - - -	Calcutta - - - -	554
Dr. Jamieson - - - -	Sharanpore - - - -	107
Professor Lees - - - -	Calcutta - - - -	547
Rajah of Travancore - - - -	Travancore - - - -	521
Major Morgan - - - -	Ootacamund - - - -	1,534
Mr. E. T. Fitzgerald - - - -	Calcutta - - - -	558
Mr. J. W. B. Money - - - -	ditto - - - -	1,369
Mr. W. Bourne - - - -	ditto - - - -	532
Captain Cox - - - -	Wynad - - - -	6
Mr. Hollock - - - -	ditto - - - -	2
Mr. T. Sheffield - - - -	Ootacamund - - - -	12
Dr. F. Day - - - -	Cochin - - - -	100
Mr. Brown - - - -	Tellicherry - - - -	12
Mr. J. Hall - - - -	Ootacamund - - - -	144
Mr. T. Knop - - - -	ditto - - - -	18
Captain Lees - - - -	Bengal - - - -	261
Mr. W. H. Rayne - - - -	Manantoddy - - - -	424
Rev. — Sawyer - - - -	Ootacamund - - - -	1,018
Mr. Freund - - - -	ditto - - - -	512

The number of plants issued to the public during the month is 318, making the total number of plants distributed 31,806.

TABLE IV.—Register of Chinchona Plants Distributed—*continued.*

NAMES.	STATION.	Number of Plants.	REMARKS.
Mr. Hollock - - - -	Ootacamund - - -	1	
Mr. J. Pierie - - - -	Seegoor - - - -	12	
Colonel Scott - - - -	Ootacamund - - -	1,236	
Mr. Berend - - - -	Cachar - - - -	275	
Rev. J. Hunter - - - -	Coonoor - - - -	12	
Mr. J. Mullaly - - - -	ditto - - - -	24	
Mr. W. H. Stanes - - - -	ditto - - - -	1,262	
Colonel R. Cooper - - - -	Kotagherry - - -	12	
Mr. F. Cockburn - - - -	ditto - - - -	12	
Colonel Woodfall - - - -	Coonoor - - - -	12	
Mr. C. Anderson - - - -	ditto - - - -	24	
Colonel Angelo - - - -	Ootacamund - - -	12	
Rev. E. Laseron - - - -	ditto - - - -	12	
Captain R. N. Taylor - - - -	Coorg - - - -	96	
Major W. Agnew - - - -	Assam - - - -	139	
Mr. V. H. Levinge - - - -	Madura - - - -	12	
Chief Commissioner of - - - -	Nagpore - - - -	28	
Mr. Fletcher - - - -	Ootacamund - - -	24	
Gool Mahomed - - - -	ditto - - - -	20	
General M'Cleverty - - - -	New Zealand - - -	28	
Mr. W. Robinson - - - -	Kotagherry - - -	30	
Mr. Crake - - - -	Wynad - - - -	12	
Mr. H. R. Dawson - - - -	Seegoor - - - -	12	
Captain Mann - - - -	Coorg - - - -	48	
Mr. E. Roberts - - - -	ditto - - - -	530	
Mr. H. Russell - - - -	Wynad - - - -	52	
Rev. — Wait - - - -	Coonoor - - - -	2	
Collector of Belgaum - - - -	Belgaum - - - -	28	
Collector of Honore - - - -	Honore - - - -	28	
Dr. Ross - - - -	ditto - - - -	15	
His Excellency the Governor - - - -	Bombay - - - -	158	
Mr. H. Hinde - - - -	Wynad - - - -	12	
Mr. E. B. Thomas - - - -	Coonoor - - - -	12	
Rajah of Poonganoor - - - -	Poonganoor - - -	12	
Major Grant - - - -	Wellington - - -	226	
Messrs. Thomson, Shaw & Co. - - - -	Poonganoor - - -	28	
Mr. J. H. Trinson - - - -	ditto - - - -	31	
Dr. Muller - - - -	Melbourne - - -	28	
Mr. Tyrrell - - - -	Mysore - - - -	12	
Dr. Sayers - - - -	Vellore - - - -	12	
Major C. P. Taylor - - - -	Ootacamund - - -	5,250	
Dr. Wilson - - - -	ditto - - - -	6	
Mr. Schnarrie - - - -	ditto - - - -	15,000	
Captain Fuller - - - -	Coonoor - - - -	417	
Dr. Drummond - - - -	Ootacamund - - -	224	
Captain Jennings - - - -	ditto - - - -	1,756	
Lieut. H. B. Montmorency - - - -	Bangalore - - - -	6	
Mr. M'Hutchin - - - -	Ootacamund - - -	3	
Colonel Molesworth - - - -	ditto - - - -	6	
Mr. C. Gray - - - -	Coonoor - - - -	12	
Mr. H. B. Leddell - - - -	Ootacamund - - -	12	
Mr. Minchin - - - -	Wynad - - - -	1,600	
His Excellency the Governor - - - -	Vizagapatam - - -	35	
Mr. R. F. Phillips - - - -	Kotagherry - - -	1,117	
Colonel Cooke - - - -	ditto - - - -	24	
Mr. G. J. Glasson - - - -	Wynad - - - -	1,000	
Dr. Macpherson - - - -	Mercara - - - -	400	
Mr. W. H. Kerr - - - -	Coorg - - - -	3,100	
Mr. James - - - -	Ootacamund - - -	1,000	
Colonel Whish - - - -	Bengal - - - -	82	

TABLE IV.—Register of Chinchona Plants Distributed—*continued.*

NAMES.	STATION.	Number of Plants.	REMARKS.
Mr. K. Mair - - - -	Calcutta - - - -	1,180	
Mr. W. Shakespear - - - -	ditto - - - -	61	
Mr. E. Meakin - - - -	ditto - - - -	168	
Mr. C. Acland - - - -	ditto - - - -	160	
Mr. K. McIver - - - -	ditto - - - -	124	
Mr. Havelock - - - -	Ootacamund - - - -	12	
Mr. H. de Facien - - - -	Kartaury - - - -	6,821	
Major Sweet - - - -	ditto - - - -	102	
Captain Campbell - - - -	Bangalore - - - -	6	
Royal Gardens - - - -	Mauritius - - - -	36	
Hon. W. R. Arbuthnot - - - -	Wynad - - - -	93	
Mr. H. Maxwell - - - -	Bombay - - - -	50	
Mrs. C. Smith - - - -	Wynad - - - -	22	
Captain Beckley - - - -	Wellington - - - -	200	
Mr. Walsh - - - -	Salem - - - -	100	
His Excellency the Governor General	Java - - - -	175	
Captain Richardson - - - -	Kulhatty - - - -	509	
Rajah of Poonagoor - - - -	Poonganoor - - - -	24	
His Excellency the Governor - - - -	Madras - - - -	24	
Mr. J. W. B. Money - - - -	Ootacamund - - - -	25,000	
Captain Mitcheson - - - -	ditto - - - -	50	
Mr. R. H. Elliot - - - -	Munjerabad - - - -	157	
His Excellency the Governor General	Goa - - - -	252	
Colonel Phayre - - - -	Rangoon - - - -	152	
Mr. Ryall - - - -	Kotagherry - - - -	24	
Mr. J. Gordon - - - -	Coonor - - - -	1,651	
Mr. J. Rohde - - - -	Neddivuttum - - - -	100	
Mr. J. Higginbotham - - - -	Goodaloor - - - -	12	
Mr. S. Pitol - - - -	Mauritius - - - -	36	
Mr. J. Horne - - - -	ditto - - - -	36	
M. Edouard Cremary - - - -	Reunion - - - -	51	
For the French Government - - - -	Algiers - - - -	45	
Mr. J. P. Norton - - - -	Shevaroy - - - -	50	
Mr. Mackay - - - -	Punjab - - - -	50	
Mr. W. Forsyth - - - -	Central Province - - - -	169	
Colonel Cadell - - - -	Coorg - - - -	62	
Mr. J. L. Browning - - - -	Wynad - - - -	4	
Mr. H. Leeds - - - -	Burmah - - - -	112	
Maloo Sait - - - -	ditto - - - -	6	
TOTAL Number of Plants - - - -		81,809	

Ootacamund,
November 1865.(signed) *W. G. McIvor*,
Superintendent, Government Chinchona Plantations.

— No. 64. —

From the Government of Madras to the Secretary of State for India.

Madras, 25 December 1865.

Proceedings of
Government,
21 December 1865.

WITH reference to paragraph 3, of your Despatch, dated 30th September 1865, we have the honour to forward, for your information, the accompanying letter from the Superintendent of the Government Chinchona Plantations, Ootacamund, respecting the treatment necessary for increasing the deposition of quinine in the bark of the chinchona. Our order on this paper, and a letter addressed by us to the Government of India on the subject, are also forwarded.

Enclosure 1, in No. 64.

From the Superintendent, Government Chinchona Plantations, to the Acting Secretary to Government, Revenue Department, Fort St. George.

Ootacamund, 24 November 1865.

1. WITH reference to the recent analysis by J. E. Howard, Esq., of the chinchona bark sent from the Neilgherries in May last, and that gentleman's remark, that our chinchona plants should be encouraged to produce quinine instead of chinchonidine, I would respectfully bring to the notice of Government the treatment necessary to effect this important change in the alkaloids.

2. Chinchona bark may, and frequently does, produce five alkaloids, namely, first, quinine; second, quinidine; third, chinchonidine; fourth, chinchonine; and fifth, aricine. The first of these alkaloids is of the greatest value in commerce, the second and third being rather more than one-half the value of the first, while the fourth and fifth are almost valueless; it is thus that the price of chinchona bark depends entirely on the quantity it contains of the three first alkaloids in a state capable of crystallization; therefore, to increase the quantity of quinine, to the diminution of other alkaloids, is the first and most important object of the cultivator, especially when it is considered that the presence of inferior alkaloids, even though valuable in themselves, add so much to the cost of manufacture, as to render their presence a disadvantage. With these important considerations in view, from the time the chinchona plants were introduced to this country, my attention has been steadily directed to ascertain, by practical observation, how and in what manner the alkaloids are formed; how they increase, and pass from one into another. Although the experiments and observations have been limited, when compared with the importance of the inquiry, still I feel satisfied that this problem has been so far solved, as to place in a great degree under the control of the cultivator, the quantity and quality of the alkaloid produced.

3. Quinine and other alkaloids are first formed or produced in the leaves by the action of light and air on the juices, and while the leaves are performing their usual office of elaborating the sap or juices of the plant. Here the alkaloids are intimately combined with the elements of the sap, such as quinic acid, &c., and in this condition carried down by the return sap, and deposited in the bark, most impure in the liber or inner bark, but as the liber becomes transformed into cellular tissue, a superior alkaloid (quinine) is produced in a state of great purity, and easy of separation. The inferior quality of the alkaloids in the liber is apparently caused by the rapid circulation, in this portion of the bark, of sap containing oxygen, from recent exposure in the leaves. Quinine being most abundant in the cellular tissue of the bark, where it is deposited at first also in an impure state, but in consequence of the retarded and horizontal circulation of the sap in this bark, the tendency of the inferior alkaloids is to pass into quinine. In the cellular tissue, however, there is also a process of waste, caused by the action of light and air on the surface of the bark; thus the quinine apparently oxidizes, becomes inseparably combined with, or passes into red colouring matter and gum. This process of waste is, however, somewhat less than the deposit or accumulation in the bark, and for this reason the alkaloids increase according to the age of the plant.

4. From the above it will be understood, that if this process of oxidation or waste from the surface is effectually prevented, quinine will be deposited and increased in the cellular

cellular tissue of the bark to an almost unlimited extent, because the leaves form the quinine laboratory, while the bark is merely the storehouse; and doubtless the leaves daily elaborate and deposit a certain proportion of quinine, and will continue to do so till the last day that a healthy leaf exists upon the tree; there is, therefore, a continual and never failing alkaloid, producing power in action; and the alkaloid thus formed and deposited can be cheaply and most effectually preserved by covering the surface of the growing bark with any material so as to exclude light and the action of the air. There will, of course, be a limit to the quantity of alkaloid that the cellular tissue will contain, which probably will be from 18 to 25 per cent. of the bulk of the bark, and, making an allowance for the less pure alkaloids of the liber, from 14 to 17 per cent. of pure quinine may be obtained from "Red Bark" thus managed.

5. In addition to protecting the alkaloids from waste, it is desirable to increase the cellular tissue, and to effect both these objects moss has been selected to cover the surface of the bark, as this material effectually excludes the light, and at the same time greatly increases the cellular tissue. By this process the yield of quinine can be tripled; quadrupled, or even more, according to the time the bark is subjected to the process, which, to develop its full advantages, should be applied for a period not less than 18 months, a longer time than this being still more advantageous. This process also gives the advantage of enabling the bark of the stems and branches to be continually removed and renewed, so that in reality the produce from an acre of land will be fully thirty times as much as that which can be obtained by the usual method of cultivation; and in order to procure to myself a participation in the benefit of results so important, I considered it desirable to secure this discovery by patent rights, under Act No. XV. of 1859.

Enclosure 2, in No. 64.

(No. 3084.)

From the Secretary to the Government of Madras to the Secretary to the Government of India.

Revenue Department, Fort St. George,
21 December 1865.

Sir,

IN forwarding the accompanying letter from the Superintendent of the Government Chinchona Plantations, Ootacamund, I am directed to draw the attention of the Government of India to the Superintendent's statement in the last paragraph, that he has applied for a patent for his discovery of the utility of moss in increasing the deposition of quinine in the bark of the chinchona.

I have, &c.
(signed) *J. D. Sim,*
Secretary to Government.

— No. 65. —

From the Government of Madras to the Secretary of State for India.

Madras, 25 December 1865.

* Proceedings of
Government,
22 December 1865.We have the honour to forward for your information the accompanying
Tabular Report* on the number, condition, &c., of the Chinchona plants on the
Neilgherries on the 30th November 1865.

Enclosure in No. 65.

Report on the Number, Distribution, and Condition of Chinchona Plants on the Neilgherries, on
the 30th November 1865.

No. of Species.	Botanical Names.	Commercial Names.	Number of Plants.	Value per Lb. of Dry Bark in the London Market.		REMARKS.
				s. d.	s. d.	
1	<i>C. succirubra</i> - -	Red Bark - -	2,62,927	2 6 to 8 9		The number of plants planted out in the plantations remain the same as in last month, namely, 2,44,871. The increase by propagation is 36,171, being 13,603 under the average of the last six months, making the total number of plants 8,87,854.
2	<i>C. Calisaya</i> , var. <i>frutex</i> , var. <i>vera</i> .	Yellow Bark - -	3,156	2 10 to 7 -		
3	<i>C. officinalis</i> , var. <i>Condamenia</i> (<i>C.</i> <i>Uritusinga</i>).	Original Loxa Bark -	8,189	2 10 to 7 -		
4	<i>C. officinalis</i> , var. <i>Bonplandiana</i> (<i>C.</i> <i>Chabuarguera</i>).	Select Crown Bark -	5,79,581	2 10 to 7 -		
5	<i>C. crespilla</i> - -	Fine Crown Bark - -	3,849	2 10 to 6 -		
6	<i>C. lancifolia</i> - -	Pitayo Bark - -	159	1 8 to 2 10		
7	<i>C. nitida</i> - -	Genuine Grey Bark -	2,786	1 8 to 2 9		
8	<i>C. species</i> without name.	Fine Grey Bark - -	8,500	1 8 to 2 10		
9	<i>C. micrantha</i> - -	Grey Bark - -	14,893	1 8 to 2 9		
10	<i>C. Peruviana</i> - -	Finest Grey Bark -	3,389	1 8 to 2 10		
11	<i>C. Pahudiana</i> - -	Unknown - -	425	Unknown.		
TOTAL Number of Plants - - -			8,87,854			

TABLE II.

MEMORANDUM of the Growth of Eleven Plants of *C. succirubra*, planted on
the Second Denison Plantation, at Neddivuttum, on the 30th August 1862.

Number of Plants.	Height in Inches when Planted on 30 August 1862.	Height in Inches on 31 October 1865.	Height in Inches on 30 November 1865.	Growth in Inches during November 1865.	By whom planted.
1	23	129	129 $\frac{1}{2}$	$\frac{1}{2}$	His Excellency Sir W. Denison. J. W. Breeks, Esq. Dr. Sanderson. J. D. Sim, Esq. Lieutenant McLeod. P. Grant, Esq. Plant cut down for bark.
2	16 $\frac{1}{2}$	114	115 $\frac{1}{2}$	1 $\frac{1}{2}$	
3	19	114 $\frac{1}{2}$	116 $\frac{1}{2}$	2	
4	15	109	110 $\frac{1}{2}$	1 $\frac{1}{2}$	
5	27	132	134	2	
6	20	106 $\frac{1}{2}$	107 $\frac{1}{2}$	$\frac{1}{2}$	
7	20	118	119	1	
8	18	123	123 $\frac{1}{2}$	$\frac{1}{2}$	
9	20	127	128	1	
10	20	127 $\frac{1}{2}$	129	1 $\frac{1}{2}$	
11	18	110 $\frac{1}{2}$	111	$\frac{1}{2}$	
12	-	76 $\frac{1}{2}$	78 $\frac{1}{2}$	2	

Table II. exhibits the growth of
eleven plants of *C. succirubra*,
planted out by his Excellency the
Governor and other gentlemen at
Neddivuttum on the 30th August
1862. The average growth of these
plants during the month is 1 $\frac{1}{2}$
inches, or 1 $\frac{1}{2}$ inches under that of
last month.

TABLE III.

SHOWING the Height of 12 Plants of *C. officinalis*, planted on the Dodabetta Plantation at Ootacamund, on the 30th September 1863.

Number of Plants.	Height in Inches when Planted, on 30 September 1863.	Height in Inches on 31 October 1865.	Height in Inches on 30 November 1865.	Growth in Inches during November 1865.	REMARKS.
1	19	100	103½	3½	<p>The 12 plants of <i>C. officinalis</i>, (a shrubby species) on the Dodabetta plantation, gives an average growth of 3½ inches, or ½ an inch under the growth of last month.</p> <p>The seeds of the different species are making satisfactory progress, and a large harvest, especially of <i>C. succirubra</i> seed, may be expected in February and March.</p>
2	14½	91½	98	1½	
3	28	101	108½	2½	
4	22	97	101	4	
5	21½	99½	103½	4	
6	28	113½	117	3½	
7	22½	95½	98½	3	
8	21½	94½	97	2½	
9	21½	105	109½	4½	
10	19½	98½	101½	3	
11	24	103½	106	2½	
12	24	102½	105	2½	

TABLE IV.

REGISTER of Chincona Plants Distributed.

NAMES.	STATION.	Number of Plants.
Mr. F. N Maltby - - - -	Travancore - - - -	16
Dr. Junghun - - - -	Java - - - -	56
Mr. A. R. Lascelles - - - -	Ootacamund - - - -	12
Mr. M. Anderson - - - -	Jamaica - - - -	2
Dr. Wiche - - - -	Bombay - - - -	10
Dr. T. Anderson - - - -	Calcutta - - - -	554
Dr. Jamieson - - - -	Saharanpore - - - -	107
Professor Lees - - - -	Calcutta - - - -	547
Rajah of Travancore - - - -	Travancore - - - -	521
Major Morgan - - - -	Ootacamund - - - -	1,584
Mr. E. T. Fitzgerald - - - -	Calcutta - - - -	558
Mr. J. W. B. Money - - - -	ditto - - - -	1,369
Mr. W. Bourne - - - -	ditto - - - -	532
Captain Cox - - - -	Wynad - - - -	6
Mr. Hollock - - - -	ditto - - - -	2
Mr. T. Sheffield - - - -	Ootacamund - - - -	13
Mr. F. Day - - - -	Cochin - - - -	100
Mr. Brown - - - -	Tellicherry - - - -	12
Mr. J. Hall - - - -	Ootacamund - - - -	144
Mr. T. Knop - - - -	ditto - - - -	18
Captain Lees - - - -	Bengal - - - -	281
Mr. W. H. Rayne - - - -	Manantoddy - - - -	424
Rev. — Sawyer - - - -	Ootacamund - - - -	1,018
Mr. Frend - - - -	ditto - - - -	512

The number of plants issued to the public during the month is 1,867, making the total number of plants distributed 83,676.

TABLE IV.—Register of Chinchona Plants Distributed—*continued.*

NAMES.	STATION.	Number of Plants.	REMARKS.
Mr. Hollock - - - - -	Ootacamund - - - - -	1	
Mr. J. Pierie - - - - -	Seegoor - - - - -	12	
Colonel Scott - - - - -	Ootacamund - - - - -	1,288	
Mr. Berend - - - - -	Cachar - - - - -	275	
Rev. J. Hunter - - - - -	Coonoor - - - - -	12	
Mr. J. Mullaly - - - - -	ditto - - - - -	24	
Mr. W. H. Stanes - - - - -	ditto - - - - -	1,262	
Colonel R. Cooper - - - - -	Kotagherry - - - - -	12	
Mr. F. Cockburn - - - - -	ditto - - - - -	12	
Colonel Woodfall - - - - -	Coonoor - - - - -	12	
Mr. C. Anderson - - - - -	ditto - - - - -	24	
Colonel Angelo - - - - -	Ootacamund - - - - -	12	
Rev. E. Laseron - - - - -	ditto - - - - -	12	
Captain R. N. Taylor - - - - -	Coorg - - - - -	96	
Major W. Agnew - - - - -	Assam - - - - -	189	
Mr. V. H. Levinge - - - - -	Madura - - - - -	12	
Chief Commissioner of - - - - -	Nagpore - - - - -	28	
Mr. Fletcher - - - - -	Ootacamund - - - - -	24	
Gool Mahomed - - - - -	ditto - - - - -	20	
General McCleverty - - - - -	New Zealand - - - - -	23	
Mr. W. Robinson - - - - -	Kotagherry - - - - -	330	
Mr. Crake - - - - -	Wynad - - - - -	12	
Mr. H. R. Dawson - - - - -	Seegoor - - - - -	12	
Captain Mann - - - - -	Coorg - - - - -	48	
Mr. E. Roberts - - - - -	ditto - - - - -	530	
Mr. H. Russell - - - - -	Wynad - - - - -	52	
Reverend Wait - - - - -	Coonoor - - - - -	2	
Collector of Belgaum - - - - -	Belgaum - - - - -	28	
Collector of Honore - - - - -	Honore - - - - -	28	
Dr. Ross - - - - -	ditto - - - - -	15	
His Excellency the Governor - - - - -	Bombay - - - - -	158	
Mr. H. Hinde - - - - -	Wynad - - - - -	12	
Mr. E. B. Thomas - - - - -	Coonoor - - - - -	74	
Rajah of Poonganoor - - - - -	Poonganoor - - - - -	12	
Major Grant - - - - -	Wellington - - - - -	226	
Messrs. Thomson, Shaw, & Co. - - - - -	Poonganoor - - - - -	28	
Mr. J. H. Trinson - - - - -	ditto - - - - -	31	
Dr. Muller - - - - -	Melbourne - - - - -	28	
Mr. Tyrrell - - - - -	Mysore - - - - -	12	
Dr. Sayers - - - - -	Vellore - - - - -	12	
Major C. P. Taylor - - - - -	Ootacamund - - - - -	5,250	
Doctor Wilson - - - - -	ditto - - - - -	6	
Mr. Schnarrie - - - - -	ditto - - - - -	15,000	
Captain Fuller - - - - -	Coonoor - - - - -	417	
Dr. Drummond - - - - -	Ootamacund - - - - -	224	
Captain Jennings - - - - -	ditto - - - - -	1,756	
Lieutenant H. B. Montmorency - - - - -	Bangalore - - - - -	6	
Mr. McHutchin - - - - -	Ootacamund - - - - -	3	
Colonel Molesworth - - - - -	ditto - - - - -	6	
Mr. C. Gray - - - - -	Coonoor - - - - -	12	
Mr. H. B. Leddell - - - - -	Ootacamund - - - - -	12	
Mr. Minchin - - - - -	Wynad - - - - -	1,600	
His Excellency the Governor - - - - -	Vizagapatam - - - - -	35	
Mr. R. F. Phillips - - - - -	Kotagherry - - - - -	1,117	
Colonel Cooke - - - - -	ditto - - - - -	24	
Mr. G. J. Glasson - - - - -	Wynad - - - - -	1,000	
Dr. Macpherson - - - - -	Mercara - - - - -	400	
Mr. W. H. Kerr - - - - -	Coorg - - - - -	3,100	
Mr. James - - - - -	Ootacamund - - - - -	1,000	
Colonel Whish - - - - -	Bengal - - - - -	82	

TABLE IV.—Register of Chinchona Plants Distributed—*continued.*

NAMES.	STATION.	Number of Plants.	REMARKS.
Mr. K. Mair - - - -	Calcutta - - - -	1,180	
Mr. W. Shakespear - - - -	ditto - - - -	61	
Mr. E. E. Meakin - - - -	ditto - - - -	168	
Mr. C. Ackland - - - -	ditto - - - -	150	
Mr. K. McIver - - - -	ditto - - - -	124	
Mr. Havelock - - - -	Ootacamund - - - -	12	
M. H. de Faccin - - - -	Kartairy - - - -	6,821	
Major Sweet - - - -	ditto - - - -	910	
Captain Campbell - - - -	Bangalore - - - -	6	
Royal Gardens - - - -	Mauritius - - - -	36	
Honourable W. R. Arbuthnot - - - -	Wynad - - - -	98	
Mr. H. Maxwell - - - -	Bombay - - - -	50	
Mrs. C. Smith - - - -	Wynad - - - -	316	
Captain Beckley - - - -	Wellington - - - -	200	
Mr. Walsh - - - -	Salem - - - -	100	
His Excellency the Governor General	Java - - - -	175	
Captain Richardson - - - -	Kulhatty - - - -	509	
Rajah of Poonganoor - - - -	Poonganoor - - - -	24	
His Excellency the Governor - - - -	Madras - - - -	24	
Mr. J. W. B. Money - - - -	Ootacamund - - - -	25,000	
Captain Mitcheson - - - -	ditto - - - -	50	
Mr. R. H. Elliot - - - -	Munjerabad - - - -	157	
His Excellency the Governor General	Goa - - - -	252	
Colonel Phayre - - - -	Rangoon - - - -	152	
Mr. Ryall - - - -	Kotagherry - - - -	24	
Mr. J. Gordon - - - -	Coonor - - - -	1,701	
Mr. J. Rohde - - - -	Neddivuttam - - - -	100	
Mr. J. Higginbotham - - - -	Goodaloor - - - -	12	
Mr. S. Pitol - - - -	Mauritius - - - -	36	
Mr. J. Horne - - - -	ditto - - - -	36	
M. Edouard Cremary - - - -	Reunion - - - -	51	
For the French Government - - - -	Algiers - - - -	45	
Mr. J. B. Norton - - - -	Shevaroy - - - -	50	
Mr. Mackay - - - -	Punjab - - - -	50	
Mr. W. Forsyth - - - -	Central Provinces - - - -	169	
Colonel Cadell - - - -	Coorg - - - -	62	
Mr. J. L. Browning - - - -	Wynad - - - -	4	
Mr. H. Leeds - - - -	Burmah - - - -	112	
Maloe Sait - - - -	ditto - - - -	6	
Mr. A. D. Brown - - - -	Dimhatty - - - -	53	
Mr. J. C. Misquith - - - -	Ootacamund - - - -	300	
TOTAL Number of Plants - - - -		83,676	

Ootacamund,
16 December 1866.

(signed) *W. G. McIvor,*
Superintendent, Government Chinchona Plantations.

— No. 66. —

The Government of Madras to the Secretary of State for India.

Madras, 13 November 1865.

1. WE have the honour to forward the accompanying very satisfactory Report from Mr. McIvor on the Government Chinchona Plantations and Botanical Gardens on the Neilgherries, for the official year 1864-65, together with our proceedings of 27th September 1865, No. 2325, containing the observations and orders we have recorded on a review of that paper.

2. With reference to the subject of paragraph 31 of the Report we have to observe that we fully appreciate the importance of obtaining Mr. Markham's opinion and advice as to the best method of harvesting and preparing the Chinchona bark, but we have lately learnt that Mr. Markham has arrived in India, and doubt not that he will visit the plantations on our hills.

3. Two other letters from Mr. McIvor relating to the Report, dated 25th September and 3rd October, will be found appended thereto.

— No. 67. —

REPORT on the Government Chinchona Plantations and Botanical Gardens on the Neilgherries, for 1864-65.

Introductory observations.	1. In submitting this Report it affords me much satisfaction to be able to state that the past season has been favourable for planting operations, and that considerable progress has been made in the works connected with our plantations. The plants continue to flourish and maintain a luxuriant state of health. The maximum monthly increase by propagation has reached as high as 31,984 plants, the average monthly propagation throughout the year being 21,200 against 15,326 the result of last year. The total number of plants on the 1st May 1865 was 5,58,105; this does not include 78,612 plants, the number issued to the public from the commencement to 31st May 1865. Our oldest plants were planted out in August 1862, and have attained heights varying from eight to 12 feet; the circumference of the stems, at six inches from the ground, varying from seven to 13 inches, the plants being well furnished with lateral branches, and present a most robust and healthy appearance. The Chinchona succirubra, Peruviana, and micrantha, continue to thrive on the Neddivuttum and Pykara plantations, at elevations varying from 4,000 to 6,000 feet, while Chinchona officinalis, Bonplandiana, and crespilla, continue to grow more sturdy and vigorous on the Dodabetta plantations, at elevations varying from 7,000 to 8,350 feet. These latter species grow equally well upon grass as upon forest land, and bear almost every exposure, hence they may be successfully cultivated over the whole plateau of the Neilgherries, excepting such land-locked hollows as are subject to severe frosts. The results of last year's analysis of the barks has exhibited a farther increase in the yield of alkaloids, which is both interesting and encouraging. The first sample of bark submitted in 1862 yielded quinine, but the quantity was not determined. The bark forwarded in 1863 yielded 4.3 per cent. of rough, and 3.30 to 3.40 of purified alkaloids, while that forwarded in May 1864 gave 6 per cent. of purified alkaloids. These are the results of the analysis by Mr. Howard; while the analysis by Dr. De Vry gives still more favourable results, that gentleman having found in specimen No. 7 as much as 8.49 per cent. of alkaloids, being fully five times the average quantity found in the barks of commerce. This result has exceeded our most sanguine expectation, and together with the observations of
Increase of propagation.	
Number of plants on 31 May 1865, 558,105.	
Height and growth of plants. Thickness of stems.	
Condition of plants at Neddivuttum and Pykara.	
Dodabetta plantations. C. officinalis and varieties grow as well upon grass as on forest land.	
Analysis of bark show great increase in alkaloids.	
Bark submitted in 1862 yielded quinine in too small a quantity to be determined; that submitted in 1863 gave 3.30 to 3.40 of purified alkaloids; while that submitted in 1864 gave 6 per cent.	
Dr. De Vry found 8.49 per cent. in one specimen of red bark.	

Fig. I.

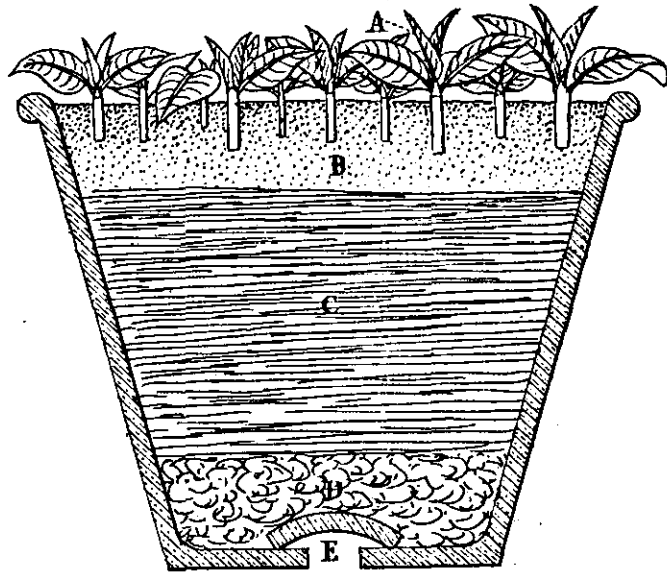
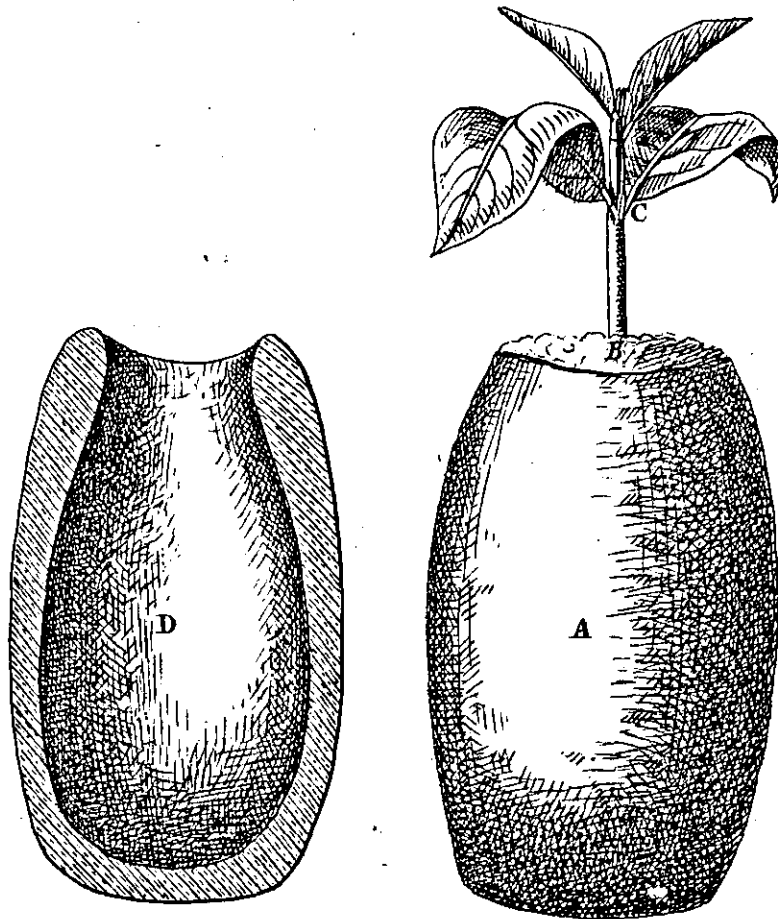


Fig. II.



Mr. Howard establishes that cultivation does greatly favour the increase of alkaloids, and also improves their quality, at least in the chinchona succirubra, and we may assume that a like result will be produced in the other species of chinchona. With these observations, I proceed to particulars which, for the sake of convenience, are arranged under the following heads :—

Cultivation seems to increase the quantity and improve the quality of alkaloids.

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Appendix A.—Accounts from the commencement of operations to the 30th April 1865.

Do. B.—Meteorological observations at Neddivuttum.

Do. C.— Ditto - Ditto at Ootacamund.

2. Owing to the large number of plants produced, and consequently the employment of much labour in this operation, we have found it necessary, in order to economize and lessen the cost of propagation, to abandon the system of placing the cuttings on a piece of brick, as described in previous reports. The method now adopted is to fill the pots as formerly with prepared soil, but only to within an inch or three-fourths of an inch of the surface; this space is then filled up with pounded brick dust, into which the cuttings are inserted as at A. in Figure I.*; B, representing the stratum of brick dust; C, the ordinary soil used and described in previous reports; D, moss to facilitate drainage; E, the potsherd or draining material. Under this treatment the cuttings are found to root more freely than by the method previously adopted, while a man can pot off in a day from four to five times the number of cuttings. This simple expedient, which may scarcely appear worth detailing, is of great importance in extensive propagating operations, as it reduces the cost to nearly one-fifth of that originally incurred, and at the same time economizing space in the propagating cases, as by the present system double the number of cuttings can be placed in a four-inch pot.

Propagation of the plants, alteration in system of.

Cuttings now planted in brick dust.

* See Drawing opposite.

When thus treated, root more freely.

This system much reduces the cost of propagation.

3. The cuttings when rooted in the propagating cases are not, as hitherto, transplanted into larger pots, but the cutting pots removed into the hardening cases, and when hardened off, the plants are placed singly into pots two inches in diameter, and about 3½ in depth, formed of a mixture of cowdung and sand, as illustrated at Figure II.*; A being the cowdung pot; B, the soil; C, the plant; D, a section. These pots are, prior to use, dried in the sun, by which they become hard and in every respect answer the purpose of an ordinary pot; when buried in the soil they become soft by the moisture, and in this condition are easily penetrated by the roots of the plants, but are still sufficiently adhesive to permit of handling, without breaking, when removing or transplanting the plants.

Rooted cuttings not transplanted from cutting pots until hardened, when they are put singly into pots formed of cowdung and sand.

* See Drawing opposite.

The cowdung pots cheaper and better than the ordinary earthen pots, and admit, in permanently planting out, of being placed together with the plant into the ground.

Condition and growth of plants.

Growth of the plants planted by the Governor and Staff in August 1862.

Bark much improved in thickness.

Can be grown to great perfection on the Neilgherries.

C. succirubra the most profitable species to cultivate.

C. officinalis and its varieties next in value.

And better suited for growth at high elevations and exposed situations.

C. Calisaya rich in quinine, but of slow growth.

Seems to grow best at high elevations.

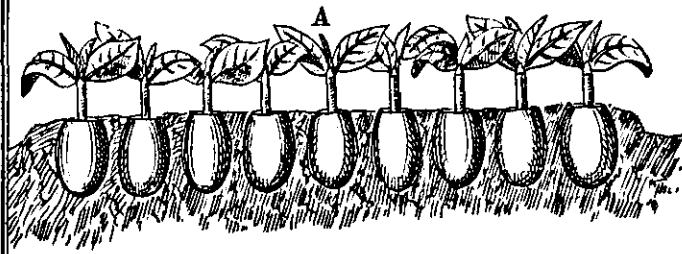
4. These cowdung pots are made by hand, and a man will make from 400 to 500 per diem; they are thus produced at less than $\frac{1}{10}$ th part of the cost of an ordinary pot, while they more effectually answer the purpose required in giving nourishment to the young plants, and, in the operation of permanently planting out, admit of the pot with the plant being at once placed into the soil, thus avoiding the injury done to the roots in removing the plant from ordinary earthen pots.

5. The first chinchona plants were permanently planted out on the 30th August 1862. The 11 plants of *C. succirubra* planted by his Excellency Sir William Denison and staff, made an average growth of 3 feet from that time to 30th April 1863, the circumference of the stems, at 6 inches from the ground, varying from 2 to 3½ inches; and from the 1st of May 1863 to 30th April 1864 these plants made an average perpendicular growth of 2 feet 11 inches, with the circumference of the stems varying from 6 to 9 inches; and from the 1st May 1864 to 30th April 1865 these plants attained an average perpendicular growth of 1 foot 6 inches, with stems varying from 8 to 12 inches in circumference. The perpendicular growth of these individual plants in the official year 1863-4 exceeded the average growth of the same species throughout the plantation by about 3 inches. This year, however, these plants have not attained the average growth of those on the plantation, in consequence of the heavy storms which have prevailed, and the situation in which they are planted, being exposed to the full force of the western winds. On the first Denison Plantation the *C. succirubra* was planted at 10 and 12 feet apart, and the branches of many of these plants are now touching each other, presenting the appearance of a luxuriant young forest. The bark has much increased in thickness, while the markings characteristic of the finest Peruvian bark become more and more apparent; mosses and lichens having developed themselves upon the stems of the oldest plants. This, in combination with the healthy growth of the trees, now establishes, beyond all doubt, that the chinchona bark can be grown on the Neilgherries to as great perfection as in the most favourable localities on the Andes. The *C. succirubra* still continues to grow most robust, and to produce the thickest and the largest quantity of bark in a given period; this species is also very hardy, and would, no doubt, be most profitable to cultivate at elevations varying from 4,000 to 6,000 feet. One plant of this species has already produced perfect seeds, and as upwards of 1,000 plants are now in bloom, we may shortly expect to be able to supply abundance of seed of this valuable species, which stands pre-eminently in the quantity of alkaloids it produces, also in the thickness of its bark, and in its luxuriant and rapid growth; in short, it possesses in the highest degree every quality necessary in a plant intended for profitable cultivation.

6. The *C. officinalis* (*Condamenia*) in cultivation promises to rank second in value, producing a bark nearly equal in thickness to *C. succirubra*, but the plant is of less luxuriant habit, although more hardy and better suited for cultivation in exposed situations and high elevations. This species, together with its varieties, *crepillia* and *Bonplandiana*, should invariably be selected for cultivation at high altitudes, as they thrive best at elevations varying from 6,000 to 8,000 feet; some plants of the *C. officinalis* are coming into bloom, and possibly may produce perfect seeds this season.

7. The *C. Calisaya* has hitherto only been planted at elevations varying from 4,000 to 6,000 feet, and here the plants thrive well, although the habit of this species is less vigorous than the "Red" or "Crown" barks, the stems scarcely increasing more than half as much as these species in thickness during the same period of growth, and consequently, as a bark-producing tree, is less valuable. A few plants of the *Calisaya*, accidentally placed out at a high elevation (7,300 feet), seem to have adopted a much more luxuriant habit than those planted at lower elevations, consequently a number of this species will be planted

Fig. III.



Improved method of transplanting

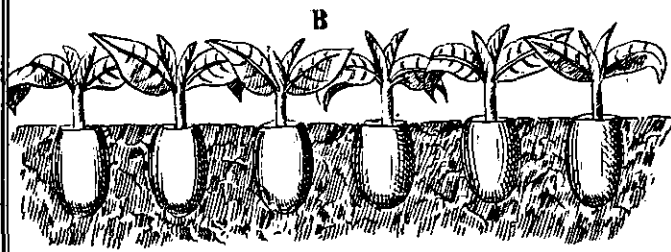


Fig. V.

Method of permanently planting out.

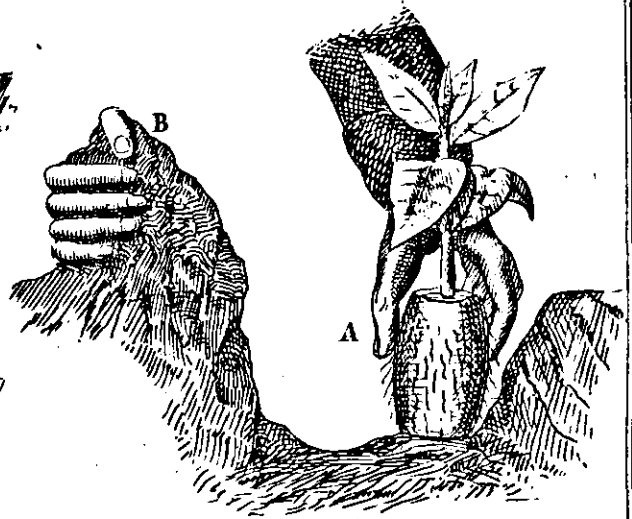


Fig. IV.

Method of transporting the plants.

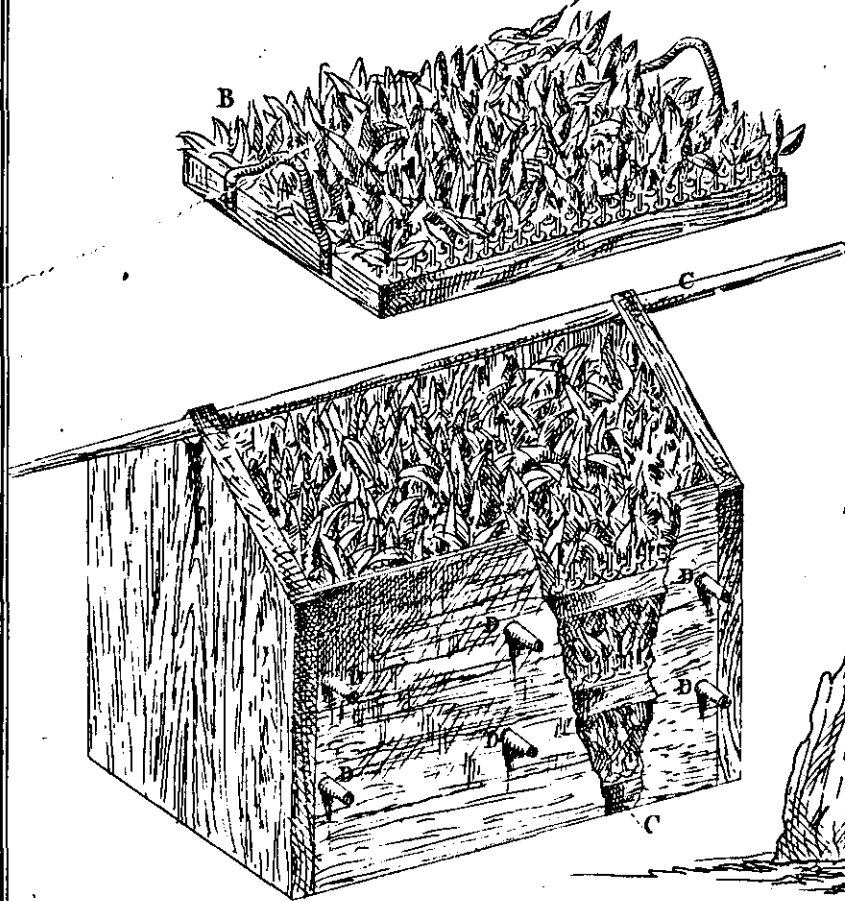


Fig. VI.

Rough wood protection & shelter for young plants.



planted during this season at much higher elevations than hitherto. Several plants of the *C. Calisaya*, planted on the 1st Denison Plantation in November 1862, are now in full bloom, presenting a most beautiful appearance, while their fragrance fills the air for a considerable distance. Now in full flower on 1st Denison Plantation.

8. The *C. lancifolia*, received from Java, much resembles the *C. Calisaya* in its habit and growth, but our experience with this species has been too short to admit of an opinion being formed of its ultimate value as a cultivated plant. The plant, no doubt, is the true *C. lancifolia* of botanists, and is a most valuable species for the production of quinine. *C. lancifolia* resembles *Calisaya*.

9. The propagation of the "Grey" barks, *C. micrantha*, *C. Peruviana*, and *C. nitida*, has been discontinued in consequence of the small quantity of quinine produced by these species; although they yield a considerable quantity of chinchonine; yet the value of this being much inferior to quinine, it has been considered undesirable further to extend their cultivation. Many of the older plants of these three species are now coming into bloom. Propagation of grey barks discontinued.
Many of these species now in bloom.

10. The *C. Pahudiana* could be grown to any extent in this locality, but in consequence of the uncertain value of the plant it has not been propagated. A few of this species are also now in bloom. *C. Pahudiana*.

11. The treatment described in previous reports has been found adapted to the requirements of the plants, but in order to lessen the labour and risks from carelessness in transplanting, some modification in our former treatment has been found necessary. The plants being established in the hardening cases, are planted in the nursery beds, as illustrated at Figure III.*: A being a transverse section of a row of Cultivation, modification in system of.

cowdung pots as placed in the beds, and filled in between with earth; B, showing a longitudinal section of the bed, the pots being placed at the distance of 2½ inches apart, and the spaces between them filled up with earth to a level with the stem of the plants. In this way the plants can be removed and transplanted by untrained labourers without danger of damage to their roots. In removing the plants from the nurseries to be permanently planted out, they are raised from the nursery beds and arranged on a light dealwood tray, 2 feet by 3 feet, as at Figure IV.* B; this tray being filled, is lifted by the handles and placed in the bottom of a box, as at C; another tray is filled in like manner, and three round sticks being run through holes in the sides of the box at D, the second tray is placed on and supported by these sticks, and the third tray treated in the same way. The box now being filled, and containing about 540 plants, is lifted by the pole G, and carried by two men to the planters, where it is deposited, the same men returning with an empty box to be refilled. The planters first draw out the pole and remove the upper tray from the box, and proceed to plant out the plants, as illustrated at Figure V.* A, * See Drawing opposite.

filling in the soil in the manner shown at B; this completed, the plants are immediately shaded with split pieces of wood, as at Figure VI.* and the operation of planting is finished. When the plants have grown above the wood, they are protected from chafing by a grass rope being twisted round the top, as at H. This rough split wood, as a protection and shade for the young plants, has been found quite as efficient as the baskets described in paragraph 27 of last year's report, and requires less labour, as one man in this manner is able to shade from 50 to 60 plants per day. The distance at which the plants are now placed, when permanently planted out, are for the "Red," "Grey" and "Yellow" barks 7 x 7 feet. The "Crown" barks in very exposed situations 4 x 4 feet, in medium exposed places 6 x 6 feet, and in sheltered localities they are also placed 7 x 7. * See Drawing opposite.

12. On our principal plantations the land was entirely cleared of forest prior to planting, but on the 1st Dodabetta Plantation, also on some portions of the 2nd, the forests were only partially cleared, in order to test the effect of cultivating the plants under the shade of * See Drawing opposite.
More economical, and as effectual as baskets.

12. On our principal plantations the land was entirely cleared of forest prior to planting, but on the 1st Dodabetta Plantation, also on some portions of the 2nd, the forests were only partially cleared, in order to test the effect of cultivating the plants under the shade of Distance at which the plants are planted.

12. On our principal plantations the land was entirely cleared of forest prior to planting, but on the 1st Dodabetta Plantation, also on some portions of the 2nd, the forests were only partially cleared, in order to test the effect of cultivating the plants under the shade of Cultivation under the shade of living trees.
Principal plantation entirely cleared of forest.

Dodabetta plantation, partly under living shade, plants do not grow well.

Are also injured by the falling of the forest trees during storms.

Suggests that the forest trees be removed.

Cultivation, results obtained in, by private planters.

Increase of private plantations.

Progress of plants in different districts of India.

78,000 plants issued to the public.

Felling forests for chinchona cultivation, effect on springs and water supply.

Streams continue to flow more copiously when forests are felled.

Question of great importance.

Felling of forests not supposed to effect rainfall.

Because young trees require more uniform moisture than old ones.

living trees, and the experience of upwards of two and a-half years, although comparatively short, is still, I think, sufficient to establish beyond doubt that they cannot be successfully grown under living shade. The plants in such situations are weak, "drawn," and liable to damp off in continuous wet weather, and they suffer much more from gales of wind than in open and even exposed places, while the accidental falling of the forest trees, which occasionally takes place, destroys many of the young plants.

13. Altogether about 40 acres of chinchona have been planted under living shade, and I would respectfully suggest that while the chinchona plants are young, the forest trees be removed from about 30 acres, preserving 10 acres by way of experiment, as it will probably be 30 or 40 years before any return can be expected from plants grown under the shade of forest.

14. Notwithstanding the scarcity of labour on these hills, and the great difficulty and expense of getting work performed, chinchona cultivation continues to be eagerly entered into by private planters, some being on a very large scale, which bids fair shortly to establish chinchona bark as a staple product of the Neilgherries. Mr. Money, a gentleman from Bengal, having procured no less than 900 acres of land in the Deva Sholah and its neighbourhood to be devoted entirely to chinchona cultivation.

15. From Mahableshwar, Belgaum, Honore, and elsewhere in the Bombay Presidency, reports have been received of the plants making fair progress, while the plants supplied to Mr. Fitzgerald at Darjeeling are succeeding well; also in the north-western provinces considerable success has been attained. From Coorg, Nuggur, and Wynad, reports have been received which seem to establish that the plants grow freely, and promise to be cultivated with great success in these localities. The number of plants issued from our nurseries to the public in three years, exceeds 78,000, and portions of these have been distributed to every district in India considered suitable to their growth.

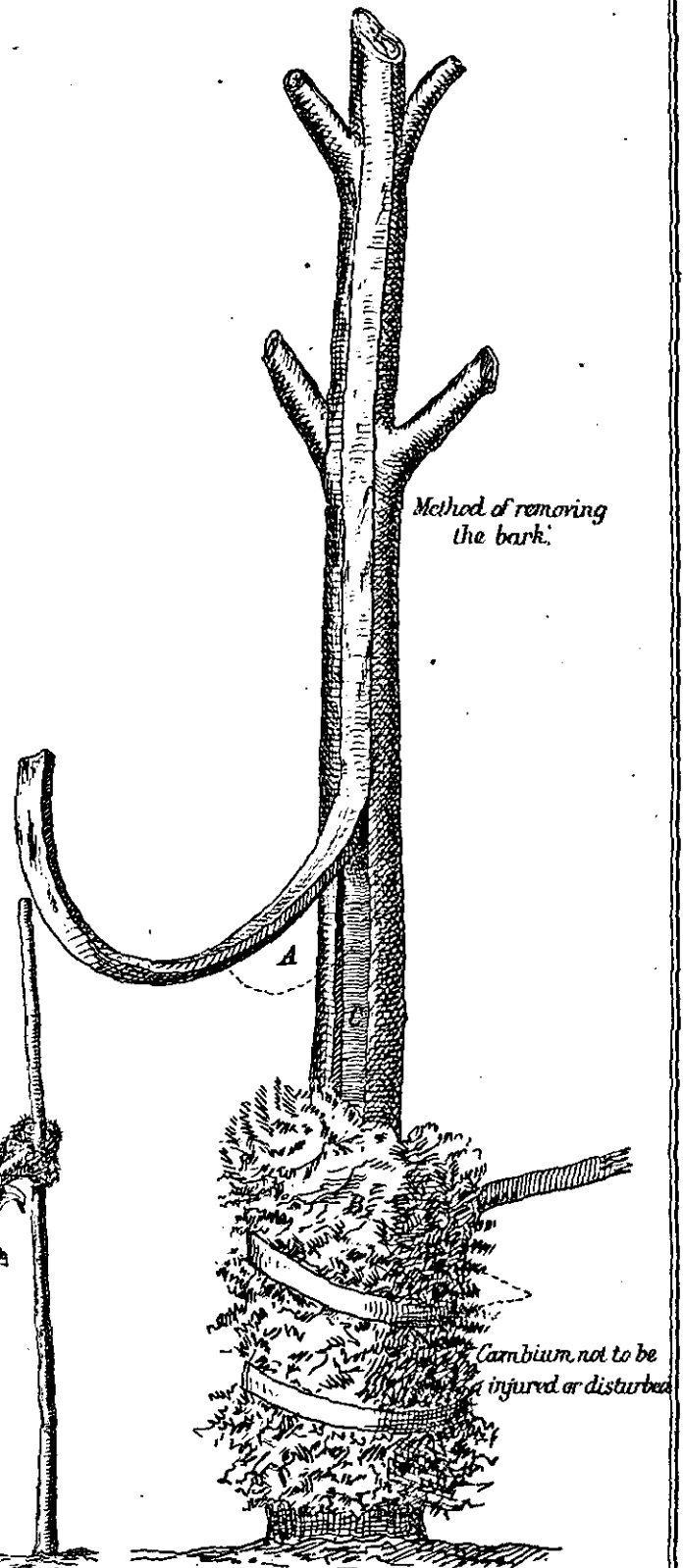
16. Further observations seem to establish the impression detailed in paragraphs 17 to 22 of last year's report, that the felling of forests at the sources of springs, and along the banks of streams, instead of diminishing (as generally believed), considerably increases the flow of water. The views on this subject, as the Government correctly observe, are not those in general acceptance, but the question is one of so great moment to India, where the water supply forms the wealth of the country, that the facts observed are worthy of careful investigation. The result of experience from the felling which has already taken place, unmistakably establishes that, in these localities at least, streams flow far more copiously, and maintain their volume much more regularly, throughout the dry season when the forests are felled, and this has continued for four years. These are facts hitherto unaccounted for, and apparently little observed, although they appear to take place in every spot where felling has been carried on to any extent. The felling of forests is not supposed in any way to increase or diminish the rainfall, but to preserve and economise it, giving off the water to the streams by the slow and regular process of filtration, the land being deprived, by felling, of the myriads of pumps in the shape of trees, which previously daily drew from the arteries and dissipated into the air an immense quantity of water.

17. The effect of forests in attracting clouds and moisture, or increasing rainfall, is a complex subject not easily subjected to practical test, but deductions drawn from the fact that young trees require for their existence more uniform moisture than old ones, it is fair to conclude that trees exercise no influence in attracting moisture, as all spots upon which forests are now found must necessarily have been more uniformly moist prior to the forests being produced than after they became established.

Fig. VII.



Fig. VIII.



18. In the extension of our operations it will be necessary to fell several other forests well calculated to test the effect of trees upon the flow of water in springs and streams, consequently instruments have been constructed to measure the flow of water in the streams issuing from these forests, for at least a year prior to the trees being felled. The flow of water from the same forests being registered by the same instruments for several years after felling, will establish the exact increase or decrease in the flow, and its variations throughout the seasons both in the unfelled and felled forests.

Instruments constructed to measure flow in streams and springs.

19. The elevations found best suited to the growth of *C. succirubra* or "Red" bark is about 6,000 feet; the plant, however, will grow at considerably greater elevations, as also down to 4,000 feet, but they have been found to thrive best at elevations varying from 5,000 to 6,200 on slopes facing the north, and well sheltered from the N.E. and S.W. monsoons. On the 1st Denison and Markham Plantations, which possess this aspect, nothing could be more satisfactory than the growth of these plants, while on the lower portion of the 2d Denison Plantation, which is very much exposed to the S.W. monsoon, and to the full effect of the rays of the afternoon sun, during the dry season, the growth of this species has been very unsatisfactory, the plants being stunted in consequence of the soil becoming parched and dried up during the months of February and March, while they are cut to pieces in the months of June and July by the violence of the winds. Various expedients have been adopted to counteract these disadvantages, and although none of them have proved quite effectual, they have been so far useful in protecting the plants as to merit description.

Cultivation, elevations and exposure best suited to.

Elevation and exposure best suited to the "Red bark."

Effects of exposure on.

20. The plants when young are shaded and protected as described in paragraph 11, and when they attain the height of one foot or 18 inches, they are staked, and tied with grass ropes as at Figure VII,* A and B, great care being taken to see that the grass rope does not touch the stem of the plant, as when this is the case, the movement of the plant with the winds cuts the bark through at the point of contact with the rope, and destroys the plant; this can be effectually avoided by drawing the rope up to encircle the leaves and small branches when present, so that the leaves or branches come between the rope and the stem of the plant. This requires particular attention; because, if not attended to, a whole plantation might be destroyed in one storm, it being much better that the plants be not tied at all, if not secured effectually.

Means of protection.

* See Drawing opposite.

21. The various species of "Crown" bark, *C. officinalis* (Condamenia), Bonplandiana (Uritusinga), and crespilla, thrive best at elevations varying from 6,000 to 8,350 feet, the latter being the highest elevation at which the plants are grown here. These species or varieties, when well secured, as described in the preceding paragraph, grow in any exposure, and even where exposed to the full force of the monsoons they are not much injured, although their leaves become shattered by the storms; fresh leaves, however, being immediately produced, the plants are not materially damaged. These species will not grow in land-locked hollows subject to severe frosts, but otherwise can be grown in almost every soil on the plateau of the Neilgherries, apparently succeeding as well in grass land as in forest. Although the "Crown" barks bear this amount of exposure, nevertheless, like all the other species of chinchona, they thrive best in well-sheltered situations, with a N. or N.E. aspect, as these localities maintain a more uniform moisture throughout the dry season, and this is highly beneficial to the growth of chinchona.

Elevations and aspects for the "Crown barks."

Bears considerable exposure.

But prefers sheltered positions.

22. The "Yellow" bark, or *Chinchona Calisaya* and its varieties, grow well at 5,000 to 6,000 feet, and also in the Wynaud at 3,000

"Yellow bark."

feet; these are the only elevations at which we have grown the plants. This species, although valuable for the production of quinine, does not promise to be a profitable plant under cultivation, in consequence of the thinness of its bark and slow growth; a few plants unintentionally placed out at a much higher elevation than formerly (7,300 feet), have assumed a more robust habit than those planted at a lower altitude.

"Pitayo bark."

23. The "Pitayo" bark, *C. lancifolia*, has been planted out at an elevation of 7,600 feet, but owing to the few plants, and the shortness of our experience with this species, it is impossible at present to state with any certainty the elevation best suited to the cultivation of the plant.

"Grey bark."

24. The "Grey" barks, *C. Peruviana*, *nitida*, and *micrantha*, have been found to grow well in the localities in which they were originally planted, at elevations varying from 4,500 up to 6,000 feet, flourishing best at the highest elevation, and in sheltered positions facing the north. During the present year these plants have not been propagated in consequence of the small quantity of quinine they produce; they are nevertheless rich in chinchonine.

C. Pahudiana.

25. The *C. Pahudiana* continues to flourish both at an elevation of 5,000 and 7,400 feet, but this has also not been increased in consequence of the uncertain value of its bark. Another species, nearly allied, if not identical with the *Pahudiana*, has recently been received from Java, but none of these have yet been permanently planted out.

Cultivation, soils best suited for.

Soils best suited to the growth of chinchona.

26. The *C. succirubra* or the "Red" barks thrive in a dark crown deep vegetable mould, resting upon an open subsoil. The *C. crespilla* in peaty land; the *C. officinalis* also grows freely in this soil, but prefers a deep brown mould; this species is also found to grow well in the laterite soils so common on the plateau of the Neilgherries. The "Yellow" and "Grey" barks prefer the same soil as the *C. succirubra*, while the *C. lancifolia* and *Pahudiana* indicate a preference for a dry and gravelly soil.

Cultivation, effects of storms and wet weather upon.

Plants, when established, are not liable to be blown down.

27. The different species of chinchona are found to establish themselves securely in the ground, in consequence of their throwing out a dense mass of fibrous root, much like the rhododendron; and thus the plants are secure against being blown down even in the heaviest storms. In exposed situations, however, the stems are occasionally broken off, while the foliage of the larger leaved species are much tattered, and have sometimes been blown away entirely; however, as the plants attain age, the leaves become smaller, and are less affected by the wind. The greatest injury the plants receive is from the branches striking against each other, and damaging the bark.

Effected by continuous wet weather.

28. The continuous rain during the last monsoon proved less injurious to our plants than the preceding one, the plants of younger growth having suffered most; only five plants of the "Grey" barks having died during the monsoon, while 25 were lost from the effects of the previous monsoon. The "Grey" barks suffer most from the effects of heavy and continuous rain, while the leaves of all the species assume a yellow tint, indicating the presence of a superabundance of moisture; but this has only proved fatal to a few plants of the "Grey" barks. All the species luxuriate and make most vigorous growth in the seasons alternated with showers and sunshine, and even continue to grow well for two months after the rain has ceased, thus establishing that they bear a considerable amount of drought without injury.

29. Further

29. Further experience in removing strips of bark indicate this to be the most profitable system. The causes of failure in our first experiments having arisen, first, from the stems not being instantly covered with moss; and secondly, from allowing lichens to be mixed with the moss used for this purpose. This season the treatment of the plants on this system has been most successful, in consequence of the stems being covered with moss the instant the strips of bark were removed, care being taken to select such moss as was entirely free from an admixture with lichens, it being found that the presence of these among the moss generated a fungus which penetrated into, and injured the wood of the plants, preventing the formation of new bark. It is, therefore, of the utmost importance to select the best green moss, a uniform bright green in its texture indicating that lichens are not present, as the whole of the tribe of lichens can easily be distinguished by the casual observer from moss, which is always of a green colour, soft and velvet-like in appearance, while the lichens are invariably of a grey, yellow, or brown colour, scaly and harsh in appearance and to the touch.

Gathering the bark, further observations on the treatment for this purpose.

Removing strips of bark most successful

Description of moss to be used for covering.

Lichens to be carefully rejected.

30. Figure VIII.* illustrates the stem of a plant with a strip of bark removed as at A; B, showing the manner in which the moss is laid on and secured around the stem. In removing the strip of bark, two parallel cuts should be made down the stem, at the distance apart of the intended width of the strip of bark, as at C; this done, the bark is raised from the sides of the cut, and drawn off, beginning from the bottom, care being taken not to press or injure the sappy matter ("cambium") left upon the stem of the tree. This cambium or sappy matter immediately granulates on the removal of the bark, and being covered forms a new bark, which maintains the circulation undisturbed. This is rather a precarious operation, and one which must be performed by intelligent men; but the results obtained by this system of treatment will no doubt double the annual yield of bark, because the renewed bark of one season's growth is quite as thick as ordinary bark of two or even three years' growth. The application of moss has also the advantage of greatly increasing the weight and thickness of the bark, and from the observations which have been made, would indicate an increase in the alkaloids, that is, a pound of bark covered with moss produces more alkaloids than the same quantity of bark not so protected. This very important question will be, to a certain extent, established by the analysis of the barks submitted to Mr. Howard in May last; but whether there is an increase in the yield of alkaloids or not, the effect of mossing the stems is to give a great increase to the yield in bark, and consequently in the value of the produce, the result of analysis already received establishing beyond doubt that the application of moss in no way decreases the yield of alkaloids. Dr. de Vry* having obtained from Neilgherry bark, treated in this manner, the enormous product of 8.409 per cent. of alkaloids, and in a state of greater purity than usually found in chinchona bark. The idea of artificially applying moss to the bark of our chinchona plants originated from the fact that the best chinchona bark of commerce is invariably overgrown with moss. Hence, the supposition that moss preserved the alkaloids from the process of oxidation

* See Drawing facing p. 165.

Quality of renewed bark.

Application of moss to thicken chinchona bark.

Effects on alkaloids and weight of bark.

* "The Chinchona Bark of British India," by Dr. J. E. de Vry, page 5.

"... The leaves of *C. succirubra*, *C. micrantha*, and *C. Pahudiana* contain traces of alkaloids; but I could not find quinine amongst them. The results of experiments on No. 7, Red bark, thickened by moss, deserve the greatest attention, for although Mr. Howard had already ascertained that Mr. McIvor's experiment of thickening the bark by covering it with moss had been really successful, I was quite struck by the enormous amount of 8.4 per cent. of alkaloids in so young a bark. The other peculiarity of this bark was that I never obtained chinchona alkaloids so easily pure as from it; hence, I hope that the experiment will be repeated by Mr. McIvor on a large scale, not only with *C. succirubra*, but also with the other species, and particularly with *C. Calisaya*."

oxidation or deterioration, which they apparently undergo when the bark is long exposed to the full action of light.

Considerations prior to reaping our first harvest of bark.

31. The period being rapidly advancing when we must begin to harvest our bark, it becomes a matter of serious consideration to devise the best means of preparing it, and, if possible, extracting the alkaloid on the spot, in order to save the cost of carriage. Connected with this subject I would much like the benefit of a personal consultation with Mr. Markham, especially as this gentleman has obtained much valuable information by experience in South America, and his intercourse with scientific men in Europe on the best methods of extracting the alkaloids. Moreover, an inspection of our plantations would enable Mr. Markham to draw a correct conclusion as to the state and health of the plants here, compared with those on the Andes.

Yield of alkaloids yearly increasing.

32. In South America the bark is gathered at random, and without reference to the period of its growth, or the best seasons for obtaining the alkaloids. The results of our observations are so limited that it is impossible to draw from them reliable practical deductions. I would, however, notice that our barks have increased in the produce of their alkaloid at the rate of about 2 per cent. per annum. As it cannot be supposed that the barks can continue to increase in this ratio, a period must occur at which the maximum quantity of alkaloids are contained in the bark, and after this there will in all probability be a period of deteriorations; should this be the case it is of vital importance for us to ascertain, and reap our harvest of bark at that period of growth when the bark contains the greatest amount of alkaloid. This refers principally to the removal of the bark from the stems of the trees, as the operation of lopping and barking the branches may have to be proceeded with for the sake of convenience, and to give light and air to the plants prior to the bark having attained its maximum quantity of alkaloid.

Must shortly attain the maximum when it should be gathered.

33. Mr. Howard's analysis of the bark submitted in May last will give much information on this subject, for if our last sample of bark gives an increase over that submitted in May 1864, it will be undesirable for us to harvest our bark until this yearly increase has ceased or at least become unimportant.

Plants when cut down for their bark, rapidly produce new shoots.

34. All the species have been found to throw out shoots from the stools when prepared, as described and illustrated at paragraph 21, Plate VI., in the manual on chinchona cultivation, dated March 1863. This will necessarily have to be practised when the plants are placed close together, and it becomes necessary to remove each alternate tree to give light and air to the plantation.

Recommends from 7,000 to 10,000 plants to be covered with moss.

35. The quotations at foot will, I trust, be sufficient to establish that no injury can accrue from the application of moss to the stems of our plants, and with the permission of Government I will at once moss from 7,000 to 10,000 of our largest plants, preparatory to removing the bark.

Effects of cultivation on the quality and produce of alkaloids.

36. The analysis by Mr. Howard* of the samples of bark collected in

* "Report of an Analysis of the Third Remittance of Bark from India.

"From J. E. Howard, Esq., to the Under Secretary of State for India, June 15, 1864.

"Sir,—I have the honour to report that I received, on the 20th May, the specimens mentioned by Mr. McIvor in his Despatch of 17th March last, and that the same were all in good condition. I have since devoted most careful attention to ascertain by experiment the probable market value especially of the first two samples of the bark sent. It will not be necessary for me to detail the various means by which I succeeded in convincing myself, not only of the existence of the alkaloids, but of their being extant in such a state of purity as is certainly not found in the ordinary samples of red

in February 1864, shows an increase in the quantity of purified alkaloid of 3.60 per cent. on the result obtained in 1863, while the result of Dr. de Vry's analysis* of bark from the same plantation, collected in

Results of analysis of bark thus treated.

bark imported from South America. The result of my examination tended to show distinctly that cultivation has improved the produce of at least this species of chinchona.

"I must remark that the commercial value of specimens of bark intended for the manufacture of sulphate of quinine can never be ascertained by the mere knowledge of the per-centage of alkaloid soluble in ether, since it is necessary that this should be shown to exist in such a state as to crystallize with acids into the required compounds.

"In the case of No. 1, the bark from the thickest part of the lower branches of *C. succirubra*, two years and five months old, this examination was most satisfactory, confirming that which I stated in my first report as to the facility with which the alkaloids were obtained in a state of purity, although the amount of red colouring matter in the bark is very great. The amount of purified alkaloids I estimate at 6 per cent., consisting of quinine 3.14, chinchonadine 2.06, chinchonine 0.80. This large product of alkaloids might probably be still further increased by surrounding the stem with moss, in the manner which Mr. McIvor has so happily suggested, since Dr. de Vry found 8.409 per cent. of alkaloids in a stem which had been so treated. It seems to me from the trial, that the East India Bark, the produce of *C. succirubra*, will rival in price the Bolivian Calisaya, which is by no means the case with the bark of the branches of the *C. succirubra*, as grown in South America. It is important to remark, that the very high price of between 8 s. and 9 s. which has quite recently been paid for red bark in this market, applies only to those prices of bark from the trunk of the tree which possess from their age a peculiarly bright red appearance: I have forwarded a small vial with commercial sulphate of quinine obtained from this No. 1, as also sulphate of chinchonadine separated from the above. I have only to remark further on this bark, that its appearance bespeaks its good quality, and that there can be no doubt the season chosen (24th of February) is most favourable to its being well secured."

* "The Chinchona Bark of British India," by Dr. J. E. De Vry * * * page 4.

Specimens Examined.	Alkaloids in 100 Parts.	Quinine.	Chinchonine and Chinchonadine.	Chinchonine and Quinidine.	Quinovic Acid.	ANALYTICAL DATA.
3. <i>C. succirubra</i> :						
a. Bark of the stem	3.637	1.486	1.171	- -	0.808	41.7 grm. of bark of the stem produced 1.168 grm. of alkaloids, and 0.160 grm. quinovic acid; of the alkaloids 0.62 grm. were dissolved by ether.
b. Bark of the root	7.614	3.443	4.071	- -	0.533	21.2 grm. bark of the root produced 1.503 grm. alkaloids, and 0.113 grm. quinovic acid; of the alkaloids 0.73 grm. were dissolved by ether.
Stem-wood	-	-	-	-	0.212	25.0 grm. dry stem-wood produced 0.053 grm. quinovic acid.
d. Root-wood	-	-	-	-	0.867	18.8 grm. dry root-wood produced 0.163 grm. quinovic acid.
4. <i>C. succirubra</i> :						
Leaves	0.017	-	-	-	1.300	32.4 grm. dry leaves produced 0.436 grm. quinovic acid; 76.7 grm. dry leaves produced only 0.013 grm. of very impure alkaloids, containing not a trace of quinine.
5. <i>C. succirubra</i> :						
Bracts	-	-	-	-	0.870	15.3 grm. dry bracts produced 0.133 grm. quinovic acid.
6. <i>C. succirubra</i> :						
Juice dried in the sun	-	-	-	-	s	2.015 grm. dried juice was proved to contain not a trace of alkaloids, but quinovic acid was readily detected.
7. <i>C. succirubra</i> :						
Bark of the stem	8.409	2.765	3.044	- -	0.530	14.9 grm. dry bark produced 1.233 very slightly coloured alkaloids, and 0.08 grm. quinovic acid; of the alkaloids 0.412 grm. were dissolved by ether.
8. <i>C. Calisaya</i> :						
a. Bark of the stem	1.890	1.220	- -	0.670	0.040	14.5 grm. dry bark produced 0.274 grm. alkaloids, and 0.093 grm. quinovic acid; of the alkaloids 0.177 grm. were dissolved by ether.
b. Bark of the root	3.100	s	- -	y	s	3.25 grm. dry bark of the root produced 0.103 grm.; alkaloids partially soluble in ether.
9. <i>C. Calisaya</i> :						
Bark of the stem	1.580	0.794	- -	0.766	0.230	8.7 grm. dry bark produced 0.133 grm. alkaloids, and 0.02 grm. quinovic acid; of the alkaloids 0.063 grm. were dissolved by ether.
10. <i>C. Pahudiana</i> :						
a. Bark of the stem	0.450	s	y	- -	s	11.1 grm. bark produced 0.05 grm. alkaloids, for the greatest part soluble in ether.
b. Bark of the root	1.363	s	y	- -	0.460	11.2 grm. bark produced 0.174 grm. alkaloids, and 0.061 grm. quinovic acid; the alkaloids were partially soluble in ether.
11. <i>C. Pahudiana</i> :						
Leaves	0.010	-	-	-	0.150	23 grm. leaves produced 0.048 grm. quinovic acid, and 0.004 grm. very impure alkaloids.
12. <i>C. micrantha</i> :						
a. Bark of the stem	2.791	-	-	-	0.113	26.3 grm. bark produced 0.79 grm. alkaloids, and 0.032 grm. quinovic acid; of the alkaloids 0.340 grm. were dissolved by ether.
b. Bark of the root	4.166	s	-	-	0.676	18 grm. bark produced 0.75 grm. alkaloids, and 0.123 grm. quinovic acid; of the alkaloids 0.13 grm. were dissolved by ether.
13. <i>C. micrantha</i> :						
Leaves	traces	-	-	-	1.276	28.4 grm. leaves produced 0.36 grm. quinovic acid; 209 grm. leaves produced only 0.008 grm. very impure alkaloid.

Shows quinine in greater abundance ;

and purity than in ordinary samples of American bark.

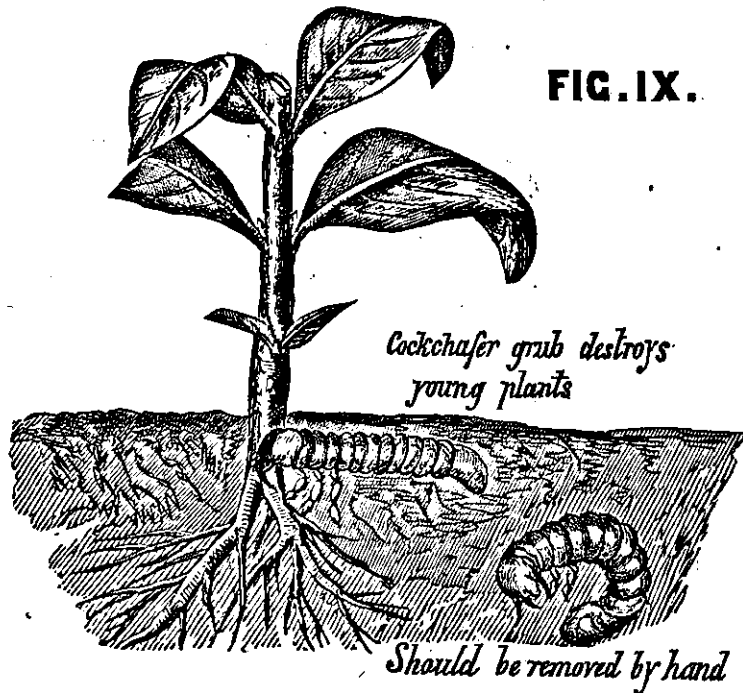
Quality of red bark improved by cultivation.

Insects injurious to chinchonas.

in November 1863, gives a result nearly the same as that obtained by Mr. Howard, with one very important exception, namely, that of sample No. 7, which yielded an increase of 5.591 per cent., or a total of 8.409 ; this bark having been covered with moss for nearly twelve months prior to the bark being removed. A peculiar feature in the mossed bark noticed both by Mr. Howard and Dr. de Vry, was the existence of the alkaloid in abundance, and in a state of greater purity than in the ordinary samples from South America.

37. While cultivation has thus improved the quality of the alkaloid, in rendering it easily purified, it has increased the quantity at least five-fold, the alkaloid, as a rule, not being found to exceed 1 per cent., in so young barks from South America. These remarks refer principally to the "Red" and "Crown" barks, which have readily assumed the habit of domestic plants, being stimulated to vigorous growth by cultivation and the application of manure, while the barks are easily thickened by the artificial application of moss, without in any way retarding the growth or affecting the health of the plants.

38. Our young plants on being transplanted are apt to be destroyed



by the grub of the cockchafer (*melalontha vulgaris*) gnawing away the bark at the crown of the root immediately under the soil, as illustrated at Figure IX. ; these grubs can only be removed by hand picking. When once they have attacked a piece of land, their presence is soon detected by the plants assuming a yellow appearance; on this taking place, the roots of every plant should be examined and the grubs destroyed. In localities liable to suffer from attacks of these grubs, the perfect insect is easily destroyed in the end of March and the

And plants examined.

How to destroy perfect insect.

Leaves of plants injured by a caterpillar like that of the oleander moth.

See Drawing opposite.

Green and white fly attacks cuttings.

Mealy and scaly bugs.

New varieties of chinchona introduced, remarks on.

C. lanceolata.

beginning of April, as it flies abroad in the evenings immediately on the commencement of the first spring showers. Bright fires being lighted here and there on the land about half-past six in the evening, and a good flame maintained until about eight o'clock, myriads of these insects dash into the flame and are destroyed.

39. The leaves of the *C. succirubra* have, during the past year, been attacked by the caterpillar of a hawk moth, nearly allied to the oleander moth, but apparently a distinct species; this caterpillar, which is illustrated in Figure X.* at B, attacks and devours the leaves with great rapidity. In order to save the plants from their ravages, considerable labour has been entailed in removing and destroying these insects. The perfect insect is shown at A, and the chrysalis at C. Our cuttings in the propagating cases, as also the plants in the houses, are liable to injury from the attacks of the green and white fly; these are easily destroyed by tobacco fumigation. The other enemies which attack the chinchona, in common with all other plants, are the mealy and scaly bugs; these like the grubs of the cockchafer can only be removed by the hand, and when once they make their appearance should never be allowed to spread.

40. During the present year, three new species or varieties of chinchona have been introduced. To the Dutch Government of Java we are indebted for *C. lanceolata*; this plant, however, does not agree with Mr. Howard's figure and description of this species, but in general appearance

Fig. X.



appearance and habit of growth, seems to be identical with the *C. Pahudiana*, and in consequence cannot be entered in our list until further information has been received on the subject, because of the inconvenience likely to arise from the distribution of species incorrectly named, and of uncertain value. Two varieties of the *C. Calisaya* have also been added to our stock, namely, *Calisaya var. frutex*, and *Calisaya var. vera*; the seeds of these varieties were imported by Mr. Markham, and are very valuable as quinine producing plants.

C. Calisaya, var. frutex, var. vera.

41. Arrangements have been made with Mr. Cross to re-collect seeds of the Pitayo barks, which failed last year afresh; a supply of these seeds may therefore be shortly expected, and it is to be hoped they will arrive in good condition and germinate freely, as the addition of this species and its varieties completes our collection of quinine yielding chinchonas.

Pitayo bark seeds to be re-collected.

42. Mr. Batcock, the Deputy Superintendent, has given every satisfaction in carrying out the work entrusted to his charge; also in superintending the payment of establishments, &c, and to whose attainments in drawing I am indebted for the illustrations in this report. Lieutenant Nichol, Assistant Superintendent, Neddivuttum plantations, has shown considerable energy and activity, and is attaining a better knowledge of the arrangement of labour, and conducting operations. Mr. Charles Dawson, Assistant Superintendent, Wood plantation, Pykara, has given every satisfaction, and is well worthy of imitation in the neat and tidy condition in which he keeps the plantations, and in the conciliatory spirit exhibited in the management of his labourers. I have also every reason to be satisfied with the manner in which Mr. Smith, the Assistant Superintendent of the Dodabetta plantations, has carried out the operations entrusted to his charge. Overseers Burrows, Hudson, and Demsey have been attentive and careful in conducting their respective works. In the office establishment, Narrainsawmy Naidoo and Mr. McNair continue to give every satisfaction in the performance of their duties as pay clerk and accountant.

Establishments.

43. The difficulties previously experienced in procuring and maintaining a sufficient number of trained labourers still continues to be severely felt, and as this difficulty seems yearly to increase, I fear a rise in our present rates of pay will be necessary. For the past year, and on the Neddivuttum plantations from the commencement, our labourers have had a slight indulgence in addition to their pay, by being supplied with grain at rates rather under those prevailing in the market, this advantage being given to the labourers by all coffee planters.

Labour difficult to be procured.

44. In addition to the range of hardening cases built in 1863 for the accommodation of 75,000 plants, our rapidly increasing stock has rendered it necessary to construct a temporary hardening house 100 feet in length by 18 wide, giving accommodation for 130,000 plants. This house has been found very useful in protecting our plants during the dry winter months. Our propagating appliances now afford accommodation for 135,000 cuttings, and hardening space for 250,000 plants. The total number of plants produced to 30th April 1865 was 645,717; of this number, 78,612 have been issued to the public; the number of plants propagated during the official year being 254,471, of which 47,489 have been sold or supplied to the public. On the 31st July 1865, the number and distribution of our plants stood as follows:—

Progress of operations.

Propagating and hardening accommodation.

Increase and distribution of plants.

Number of plants permanently planted out in the plantations	205,678
Ditto of plants in the open air nurseries	217,000
Ditto of rooted plants in the propagating and hardening houses	284,919
Estimated number of cuttings in the propagating cases	100,000

Total Number of rooted plants and cuttings - - - 807,597

Open air nurseries.

45. Extensive open air nurseries have been formed on the different plantations for the reception of the plants propagated this season. The old nurseries contained on the 1st May 1865, 134,000 well established plants; a portion of these have since been permanently planted out, and the nurseries re-stocked with young plants from the hardening houses. The nursery on the Dodabetta plantations has been enlarged to receive 150,000 plants. On the Neddivuttum plantations, 250,000; on the Wood plantation at Pykara, 150,000; and on the Mélkondah plantation, 30,000. This arrangement has been made in order to secure a large stock of well-established plants, they being found to transplant much better than plants direct from the hardening houses. The open air nursery at Ootacamund, enclosed by a brick wall, has also been extended, and now affords space for the reception of about 350,000 plants. This nursery is at present used for rearing eucalypti and other trees for planting the ridges on our plantations, and the Lawrence Asylum sites. In extending these nurseries the beds have been formed in the manner described in the "Manual on Chinchona Cultivation," and the plants recently planted as described at paragraph 11 of this report.

Nursery at Ootacamund at present used for rearing eucalypti, and other trees.

On the Neddivuttum plantations 60 additional acres planted, making 284 acres under cultivation.

46. On the Neddivuttum plantations 64 additional acres have been planted, making the total at that place of 284 acres under cultivation. This extension has been on the Markham and 2nd Denison plantations. Here 20 acres of additional forest have also been felled during the season, and about 50 acres pitted. The roads, drains, and water-courses through the Markham and Kilgraston plantations have been finished, together with the trenches inclosing these plantations, and a considerable portion inclosed by a high fence to exclude wild animals. On the 1st Denison plantation no planting operations have taken place, further than filling up a few spaces near the roads; here, however, additional surface drains have been formed, and pathways cut intersecting the plantation, and rendering every part of it easily accessible from the main roads. In this plantation nothing can be more satisfactory than the growth and condition of the plants.

Second Denison plantation much exposed to west winds.

Gaol in course of construction.

To be ultimately used as a bark store.

47. On the 2nd Denison plantation the plants have not made such satisfactory growth, in consequence of being exposed to the full force of the winds. On the Markham and Kilgraston plantations the plants have made very satisfactory growth, these plantations promising in every respect to be fully as well suited to the growth of chinchonas as any site yet selected. On the Markham plantation a large gaol is in course of erection for the reception of 270 prisoners, to assist in working the plantations. This building is constructed with the intention of being ultimately formed into a bark store, and drying house, consequently the main walls have been raised high, so as to admit of a flooring being introduced. The upper main rooms to be used for storing the bark, the lower floor being furnished with flues will form the drying rooms. The walls, roof, and outside plastering of this building have been finished. The plastering of the interior, the sleeping benches, air drains, and out-offices have still to be completed. The two main rooms are intended to accommodate 225 native prisoners, and the eight verandah rooms 50 Chinese convicts, the other rooms being intended for the use of the police. On this plantation lines for koorumbers and the native artizans employed on the buildings have been constructed.

On the Wood plantation 63 acres planted, making 71 under cultivation.

48. On the Wood plantation at Pykara 63 acres of land have been planted during the season, which, together with the 8 acres planted in 1863-64, gives a total at that place of 71 acres under cultivation; a further extent of 40 acres has been cleared, and is now in course of preparation for planting. In addition to this the avenue leading past the waterfalls has been re-planted, the roads widened, and edged with grass or box, a few arbours erected, and the main water channel from the Pykara river for the supply of the plantation reveted and well secured.

49. On

49. On the Dodabetta plantations the work has also progressed satisfactorily, 57 acres having been planted out during the season, making the extent under cultivation on these two plantations 152 acres. On the Second plantation several new roads have been formed, others widened and edged with grass or box, all the planted land drained, and about 70 additional acres pitted, or in course of preparation for planting. On this plantation a gaol has been erected for the accommodation of 100 prisoners, the main room to contain 70 native prisoners, and eight of the verandah rooms to accommodate 30 Chinese prisoners, the other rooms being for the police. This building is completed and ready for occupation; some of the out-offices, including the latrines, have not yet been finished, but will probably be so in the course of a month. This gaol is also constructed so as ultimately to be converted into a bark store.

Dodabetta plantations, 57 acres planted, making 152 under cultivation.

Gaol for prisoners finished; out-houses yet to be completed.

50. In forming the new plantation on the Koondahs, great difficulty still continues to be experienced in pushing forward operations, in consequence of the want of roads. Here, however, an extent of 193 acres has been felled, of this 150 acres have been lopped and burned, 75 acres pitted. The roads on the plantation are in a forward state, and when this portion is drained will be ready for the reception of the plants. The Superintendent's house has been built, a line of road traced and used as a bridle-path connecting the plantation with Ootacamund, a distance of 29 miles. The opening out of this line of road for cart traffic will probably cost between 30,000 and 40,000 rupees, but it would render available this hitherto untouched, although the finest tract of land on the Neilgherries, for tea and chinchona cultivation. I would respectfully suggest that the opening of this road be undertaken by the Department of Public Works, as it will be of immense advantage not only for the Government plantation, but for private planters who wish to open in this direction. The Bowany river being unbridged, prevents communication between the Koondahs and the Neilgherries during the monsoon. On the Mail-koondah plantation a gaol is also in course of construction. This building is intended to accommodate 95 native prisoners and 30 Chinese convicts. Only 5,000 plants have been placed in the nurseries on this plantation.

Mail-koondah plantation.

Operations.

Gaol in course of construction.

51. In the botanical gardens considerable improvements have lately been effected; between the upper and lower gardens an Italian parterre has been introduced with three basins for fountains; the eastern half of this parterre being finished, is planted with choice flowers and has become very attractive. A new orchid and fern house is in course of construction, which will prove of great advantage in enabling us to cultivate these very interesting tribes of plants. The house being furnished with a cascade and fountain, and placed in a well-protected position in the garden, offers every advantage for growing these plants; small parterres and terraces filled with flowering plants have also been added in the upper portion of the garden.

Botanical gardens, improvements in.

New orchid and fern house.

52. Arrangements have been made for labelling the plants in the gardens with their botanical names, classes, and orders, &c., the labelling being carried out simultaneously with the preparation of a catalogue of the plants. This list of plants is contemplated to be something more than a mere catalogue, as we possess many plants of interest, and especially the economic plants may be accompanied by a short notice of their habit of growth, soil, cultivation, &c.

Labelling plants.

And preparation of catalogue.

53. This season has added many valuable plants to our collection; and to his Excellency Sir William Denison we are indebted for supplies of fine seeds of the valuable timber trees of Australia; among these may be particularly mentioned, as introduced in large quantities, the various species of eucalyptii, as also the very valuable Arancarias Cookii, and Bidwillii, and the much prized Myall or violet scented acacia; likewise phormium tenax or New Zealand flax, the New Holland nymphaas, and several species of tropadlum. To General

Plants introduced.

McCleverty we are indebted for spores of several pretty New Zealand ferns which have germinated freely, especially the sweet-scented doodia; this gentleman has also supplied seeds of *Edwardsia microphylla*, a handsome Australian shrub. To Dr. Cleghorn we are indebted for seeds of various Himalayan trees; among these was a species of cherry apparently nearly allied to the British species, and as this plant succeeds admirably, will prove invaluable as a stock on which to graft the hybrid varieties. Dr. Cleghorn also supplied seeds of the best variety of the Bengal "bael." From the Mauritius Botanic Garden a Wardian case has been received in exchange for ferns and chinchonas, containing two valuable species of guava, the Chinese litchi, the camphor tree, and many other useful plants. To Major Michael we are indebted for a small collection of seeds of New Zealand trees and shrubs, which have grown freely, and containing many new and valuable species. To Captain Beddome, Acting Conservator of Forests, we are indebted for spores of many new and rare ferns; also to Colonel Scott for good seeds of the *arbutus imedo*.

Distribution of garden plants and seeds.

54. The following Table exhibits the distribution of garden plants, seeds, &c., for 1864-65:—

Months.	Fruit Trees and Shrubs.	Timber Trees.	Shrubs and Flowers.	Collections of Seeds.	Amount.
					<i>Rs. a. p.</i>
1864.					
May - - - -	53	252	399	10	360 2 -
June - - - -	4	260	266	27	280 7 -
July - - - -	-	100	48	37	241 8 -
August - - - -	164	2	199	27	289 2 -
September - - - -	-	12	119	29	175 5 -
October - - - -	6	22	174	15	151 14 -
November - - - -	-	8	149	9	79 8 -
December - - - -	16	-	64	3	50 14 -
	243	656	1,418	157	1,628 7 -
1865.					
January - - - -	-	-	56	13	41 10 -
February - - - -	26	-	2	8	148 6 -
March - - - -	43	44	144	20	135 12 -
April - - - -	4	76	274	27	283 6 -
TOTAL Distribution - -	316	776	1,894	225	2,237 9 -

Tea plantation.
Tea plantation, 7 acres planted.
Additional land prepared to be planted with chinchona.

55. In the tea plantation sanctioned in G. O., dated 23rd December 1863, No. 2,362, seven acres have been planted with about 9,000 plants of the Chinese and Assam varieties of tea, this extent having been planted, and about 12,000 additional pits made prior to the receipt of the G. O., dated 29th January 1864, No. 162, limiting the tea plantation to five acres, consequently no further operations beyond weeding, &c., have been in progress on this plantation, and the unplanted pits will be filled up with chinchona plants. The tea plants have made fine

fine growth, and will no doubt continue to do so, as the situation is well protected from the S. W. mousoon, the soil deep and of good quality. The tea seeds received from Dr. Jameson in March last, have not grown well, having apparently suffered much on the journey; their germinating powers were in a great degree destroyed.

Tea seeds received from Dr. Jameson arrived in bad condition.

56. At the new Lawrence Asylum sites 10,300 eucalyptus trees have been planted in clumps and belts, so as to afford shelter to the buildings, the species used being principally the eucalyptus globulus (blue gum), and eucalyptus giganteus (stringy bark); about 6,000 other trees more of an ornamental nature, such as willows and cypress, have also been planted along the avenues and bordering the belts and clumps of eucalypti.

Lawrence Asylum sites.

Timber trees planted.

57. Our chinchona plants being now produced at about one-fourth the cost originally incurred, I would most respectfully submit, for the consideration of Government, that the time has arrived when a reduction must be made in the prices charged to the public. The plants could be disposed of when 5,000 and upwards are taken by one party at the rate of 1 anna each, and 2 annas each, for any number under 5,000. This difference is not more than will be necessary to compensate for the comparatively additional labour and expenses in sending out small numbers of plants, as also to give encouragement to cultivation on a large scale; the above rates will, I calculate, cover the actual cost of production, including a reasonable per-centage on the cost of our propagating houses.

Concluding remarks.

Suggests a reduction in the price of chinchona plants.

To encourage cultivation on a large scale.

58. The majority of European gentlemen at present engaged in cultivation on these hills, from want of experience, have been unsuccessful in propagation, as also in transplanting these delicate plants, although qualified to carry on the cultivation successfully when the plants are established or delivered to them in such a condition as to be easily transplanted; our recent improvements in the preparation of the young plants, will enable us to deliver them in such a condition as they cannot be well injured in transplanting. This, together with the price being reduced to its lowest rate, will, I submit, give a great stimulus to chinchona cultivation on the Neilgherries, which must ultimately be productive of benefit to the Government, while it will secure the main object for which the plants were introduced, namely, an abundant and regular supply of quinine.

59. From the above details it will be observed that, during the year, our operations have made satisfactory progress; still the scarcity of labour continues to be severely felt, rendering it impossible to perform the different operations in their proper seasons; this great drawback, which has continued from the commencement of this undertaking, will, I trust, be overcome so soon as we are supplied with the 500 convicts sanctioned by Government for the working of our plantations. The accommodation for these convicts will shortly be completed on all the plantations; the gaol on the Dodabetta plantations, as before noticed, is now finished.

60. In conclusion, I beg to tender my grateful acknowledgments to his Excellency Sir William Denison and the Government of Madras, for the very liberal manner in which they have met every suggestion tending to facilitate the progress of this undertaking; to Mr. Markham, of the India Office, my best thanks are due, for much valuable information; also to Mr. Howard and Dr. de Vry, for the very important information these gentlemen have furnished on the formation of alkaloids in our Neilgherry barks.

(A.)—SANCTIONED ESTIMATE COST of each CHINCHONA PLANTATION, from Commencement of Operations to 30th April 1865.

PARTICULARS.	1.	2.					3.				4.			
	Operations preparatory to Receipt of Plants.	Superintendent and Office Establishment.					Nursery Department.				Dodabetta Plantations.			
	1860-61.	1861-62.	1862-63.	1863-64.	1864-65.	1861-62.	1862-63.	1863-64.	1864-65.	1861-62.	1862-63.	1863-64.	1864-65.	
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
Grant for the preparation of sites - - -	2,000	-	-	-	-	-	-	-	-	-	-	-	-	
Establishments, including salaries, &c. - - -	-	4,200	5,350	5,880	8,180	3,324	4,305	4,609	3,948	2,280	5,400	5,700	7,248	
Buildings - - -	-	-	-	-	-	{ 1,200 2,000 }	-	-	800	560	-	-	600	
Tool and store rooms - - -	-	-	-	-	-	-	-	-	-	-	250	-	250	
Coolies' quarters - - -	-	-	-	-	-	-	-	-	-	200	500	-	-	
Felling - - -	-	-	-	-	-	-	-	-	-	400	1,500	-	550	
Clearing - - -	-	-	-	-	-	-	-	-	-	280	1,500	-	550	
Pitting - - -	-	-	-	-	-	-	-	-	-	400	1,500	-	550	
Carriage of plants - - -	-	-	-	-	-	-	-	-	-	150	-	-	150	
Planting and shading - - -	-	-	-	-	-	-	-	-	-	200	500	-	200	
Trenching - - -	-	-	-	-	-	-	-	-	-	1,800	-	-	500	
Inclosing - - -	-	-	-	-	-	756	-	-	-	-	5,850	-	550	
Road making - - -	-	-	-	-	-	-	-	-	-	-	2,026	-	-	
Tools - - -	-	-	-	-	-	-	-	-	-	-	1,200	-	800	
Contingencies - - -	-	-	-	-	-	196	-	-	300	399	1,200	-	500	
TOTAL - - - Rs.	2,000	4,200	5,350	5,880	8,180	7,476	4,305	4,609	5,048	6,669	21,425	5,700	12,448	

PARTICULARS.	5.				6.			7.		8.
	Neddivuttam Plantations.				Pykara Plantations.			Mailkoondah Plantations.		
	1861-62.	1862-63.	1863-64.	1864-65.	1862-63.	1863-64.	1864-65.	1863-64.	1864-65.	Rs.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Grant for the preparation of sites - - -	-	-	-	-	-	-	-	-	-	2,000
Establishments, including salaries, &c. - - -	5,064	8,412	15,348	12,360	-	4,033	6,564	-	5,600	1,17,805
Buildings - - -	2,080	-	-	750	{ 1,530 2,000 }	-	-	-	750	12,270
Tool and store rooms - - -	250	-	-	400	250	-	350	125	150	2,025
Coolies' quarters - - -	1,000	1,000	-	300	1,000	-	200	500	250	4,950
Felling - - -	1,500	3,000	-	900	1,500	-	900	6,150	900	17,300
Clearing - - -	1,500	3,000	-	900	1,500	-	900	-	900	11,030
Pitting - - -	2,000	3,000	-	900	-	-	900	-	900	10,150
Carriage of plants - - -	450	450	-	400	-	-	350	-	50	2,000
Planting and shading - - -	550	550	-	350	-	1,300	250	-	-	3,900
Trenching - - -	4,000	-	-	1,100	-	8,000	1,250	-	1,250	17,900
Inclosing - - -	3,900	-	-	-	-	750	-	375	300	12,481
Road making - - -	1,520	-	-	550	-	1,350	200	675	1,500	7,820
Tools - - -	1,282	-	-	900	-	1,282	500	641	700	7,305
Contingencies - - -	2,003	1,831	-	600	-	2,046	350	846	250	10,521
TOTAL - - - Rs.	27,099	21,243	15,348	20,410	7,780	18,761	12,714	9,312	13,500	2,39,457

Government Gardens, Ootacamund,
16 August 1865.(signed) W. G. McIvor,
Superintendent, Government Chinchona Plantations.

(A.)—ACTUAL EXPENDITURE ON each CHINCHONA PLANTATION, from Commencement of Operations to 30 April 1865.

PARTICULARS.	1.	2.					3.				4.			
	Operations preparatory to Receipt of Plants.	Superintendent and Office Establishment.					Propagation and Nursery Department.				Dodabetta Plantations.			
	1860-61.	1861-62.	1862-63.	1863-64.	1864-65.	1861-62.	1862-63.	1863-64.	1864-65.	1861-62.	1863-64.	1863-64.	1864-65.	
	Rs. a. p.	Rs.	Rs.	Rs.	Rs.	Rs. a. p.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
Establishment, including salaries, &c.	114 2 3	4,347	5,343	6,437	7,971	2,024 11 6	3,329	3,440	3,478	1,481	2,274	2,605	7,083	
Buildings	-	-	-	-	-	2,647 - -	3,578	3,000	1,500	865	-	-	7,250	
Tool and store rooms	-	-	-	-	-	-	-	-	-	-	-	230	-	
Coolies' quarters	-	-	-	-	-	-	-	-	-	-	250	500	-	
Felling	302 5 3	-	-	-	-	-	-	-	-	448	750	500	650	
Clearing	-	-	-	-	-	-	-	-	-	400	750	400	650	
Pitting	-	-	-	-	-	-	-	-	-	848	750	1,010	500	
Carriage of plants	-	-	-	-	-	-	-	-	-	245	200	140	250	
Planting and shading	-	-	-	-	-	-	-	-	-	355	450	560	700	
Trenching	-	-	-	-	-	-	-	-	-	-	-	1,200	600	
Enclosing	-	-	-	-	-	-	-	-	-	-	2,800	-	357	
Road making	300 - -	-	-	-	-	-	-	-	-	600	700	2,070	1,000	
Tools	271 - -	-	-	-	-	-	-	-	-	394	304	600	499	
Contingencies	67 - -	-	-	-	50	-	-	-	450	124	460	500	800	
TOTAL - - Rs.	1,054 7 6	4,347	5,343	6,437	8,021	4,671 11 6	6,907	6,440	5,428	5,760	9,689	10,315	20,339	

PARTICULARS.	5.				6.			7.		8.	
	Neddivuttum Plantations.				Pykara Plantations.			Malakoondah Plantations.			TOTAL.
	1861-62.	1862-63.	1863-64.	1864-65.	1862-63.	1863-64.	1864-65.	1863-64.	1864-65.		
Rs. a. p.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs. a. p.		
Establishment, including salaries, &c.	2,910 - -	6,195	5,674	12,507	- -	1,608	1,660	- -	971	81,871 13 9	
Buildings	1,580 - -	-	1,000	8,550	1,683	- -	-	350	500	32,488 - -	
Tool and store rooms	-	350	500	450	275	- -	250	- -	300	2,355 - -	
Coolies' quarters	-	1,750	1,000	500	1,100	550	250	- -	250	6,150 - -	
Felling	1,780 7 8	1,500	2,200	800	1,550	2,000	750	2,400	851	16,431 12 6	
Clearing	-	1,500	2,200	500	1,125	2,000	750	1,125	500	11,900 - -	
Pitting	1,680 7 3	858	2,000	700	- -	1,000	600	- -	738	10,694 7 3	
Carriage of plants	540 1 9	900	750	362	- -	65	350	- -	-	3,802 1 9	
Planting and shading	640 1 8	900	898	500	- -	65	300	- -	-	5,368 1 8	
Trenching	-	1,972	1,780	1,135	- -	-	1,000	- -	-	7,687 - -	
Enclosing	-	1,580	900	-	- -	679	-	-	300	6,586 - -	
Road making	1,100 - -	1,000	2,000	327	- -	1,500	504	502	875	12,474 - -	
Tools	700 - -	400	868	650	- -	1,500	1,000	- -	1,000	8,178 - -	
Contingencies	340 - -	915	850	1,200	- -	400	250	100	125	6,631 - -	
TOTAL - - Rs.	11,251 1 11	19,790	22,912	23,181	5,683	11,367	7,880	4,477	6,410	2,12,602 4 11	

Government Gardens, Ootacamund,
16 August 1865.

(signed) W. G. McIvor,
Superintendent, Government Chinchona Plantations.

(B.)--METEOROLOGICAL OBSERVATIONS made on the Government Chinchona Plantations at *Neddivuttum*, from 1st May 1864 to 30th April 1865.

MONTHS.	Dry Bulb Thermometer.	Wet Bulb Thermometer.	Maximum Thermometer.	Minimum Thermometer.	Terrestrial Radiating Thermometer.	Rainfall.	Days with Rain.	Days without Rain.
						<i>Inches.</i>		
May - - -	68	-	-	-	-	8.80	6	25
June - - -	69	-	-	-	-	28.98½	18	17
July - - -	68	57	68	54	59	65.29	8	23
August - - -	58	57	66	54	58	9.96½	9	22
September - -	59	57	68	55	58	11.18½	12	18
October - - -	61	60	71	56	59	4.51	4	27
November - - -	60	55	70	54	59	1.30½	6	24
December - - -	60	55	75	53	59	.3	-	31
January - - -	59	51	77	50	60	.81	-	31
February - - -	61	55	74	54	63	.29	1	27
March - - -	66	57	80	56	66	.79½	3	28
April - - -	66	59	82	68	65	5.80½	1	29

Government Gardens, Ootacamund,
16 August 1865.(signed) *W. G. McIvor*,
Superintendent, Government Chinchona Plantations.(C.)--METEOROLOGICAL OBSERVATIONS made at the Botanical Gardens, *Ootacamund*, from 1st May 1864 to 30th April 1865.

MONTHS.	Dry Bulb Thermometer.	Wet Bulb Thermometer.	Maximum in Shade.	Minimum in Shade.	Solar Radiation.	Terrestrial Radiation.	Rainfall.	Days with Rain.	Days without Rain.
							<i>Inches.</i>		
May - - -	69	58	-	-	-	-	6.38½	18	13
June - - -	69	58	-	-	-	-	5.23	21	9
July - - -	55	54	-	-	-	-	8.66	26	5
August - - -	56	54	64	50	-	-	6.16	20	11
September - -	56	54	65	46	-	-	3.92	12	18
October - - -	56	52	67	49	-	-	3.55	10	21
November - - -	56	52	68	47	-	-	2.64	13	17
December - - -	56	49	71	46	-	-	.86	6	25
January - - -	57	48	71	42	-	-	.47	8	28
February - - -	58	51	73	45	111	83	.9	2	26
March - - -	61	51	75	49	115	86	.13	2	29
April - - -	62	55	74	53	115	84	5.6	16	14

Government Gardens, Ootacamund,
16 August 1865.(signed) *W. G. McIvor*,
Superintendent, Government Chinchona Plantations.

— No. 68. —

Order of the Madras Government, 27 September 1865.

1. THE results of the year's operations detailed in the above Report may be briefly epitomised as follows.

2. The average monthly increase in the number of plants by propagation was 21,200, and the total number of plants on 1st May 1865 was 558,105, exclusive of 78,612 plants issued to the public.

3. The oldest plants, which were planted out in August 1862, are now from 8 to 12 feet in height, and from 7 to 13 inches in girth, at 16 inches from the ground, "well furnished with lateral branches, and present a most robust and healthy appearance."

4. The analysis of the barks has exhibited a further increase in the yield of alkaloids, Mr. Howard having obtained 6 per cent. of purified alkaloids, while Dr. De Vry found in one specimen as much as 8.49 per cent. of alkaloids, being fully five times the average quantity found in the barks of commerce.

5. In the oldest plantations the branches of the plants 10 and 12 feet apart are now touching each other; the bark has much increased in thickness. The characteristic markings of the finest Peruvian bark are becoming more and more apparent, lichens and mosses being freely developed. The plants are flowering freely, and perfect seeds have already been obtained; in short, there is no room to doubt that the chinchona can be grown on the Neilgherries to as great perfection as in the most favourable localities in which it has been found, and the "Crown" bark species is found to do well in almost every soil on the plateau of the hills, in grass land as well as in forest, so long as land-locked hollows are avoided, in which it suffers from frost.

6. Additional hardening houses and nurseries have been provided.

7. At Neddiwuttum 64 more acres have been planted, and a total area of 284 acres is there under cultivation. About 50 more acres have been pitted, and 20 acres of forest felled.

8. A building to be used temporarily as a gaol for 270 convict labourers, and ultimately as a bark store and drying-house, is under construction.

9. At Pykara 63 more acres have been planted, making a total of 71 acres under cultivation, and a further extent of 40 acres is under preparation.

10. At Doddabett 57 more acres have been planted, making a total of 152 acres cultivated, and 70 more acres are under preparation.

11. A building to be temporarily occupied by 100 convict labourers, and ultimately converted into a bark store, has been completed.

12. On the Koondahs 193 acres are in different stages of preparation. A superintendent's house has been built, and much road work done.

13. A building to be temporarily used as a gaol for convict labourers is under construction, and about 5,000 plants have been placed in the nurseries.

14. Thus altogether an additional area of 184 acres has been planted during the season, and a further area of 373 acres is under preparation.

15. The total extent planted is 507 acres, viz. :—

	Acres.
Neddiwuttum - - - - -	284
Pykara - - - - -	71
Doddabett - - - - -	152
	507

16. The total cost of the operations up to 30th April 1865 was 2,12,602 rupees, thus distributed,—

	Rs.
Establishment - - - - -	81,872
Buildings - - - - -	40,988
Plantations - - - - -	62,459
Roads - - - - -	12,474
Tools - - - - -	8,178
Sundry contingencies - - - - -	6,631
	2,12,602

17. The Government consider that the progress in the operations has been very satisfactory, and they congratulate Mr. McIvor on the important success that has attended his labours in this national undertaking.

18. He will act as he thinks best in regard to the removal of the forest trees referred to in paragraph 13.

19. The subject of paragraph 31 will be submitted for the consideration of the Secretary of State. The Government fully appreciate the importance of obtaining Mr. Markham's opinion and advice as to the best method of harvesting and preparing the bark.

20. Mr. McIvor has full permission to carry out the experiment proposed in paragraph 35, for extended mossing.

21. The subject of completing the road to the Koondahs from Ootacamund will be considered in the Department Public Works.

22. The Government are glad to note the favourable terms in which Mr. McIvor notices the services of his assistants.

23. As requested, 300 copies of paragraphs 2 to 13 and 19 to 35 inclusive of the Report will be struck off separately, printed uniformly with the Manual, to which they will be added.

24. The account of the Botanical Gardens is very satisfactory, and the Government are glad to learn that a *catalogue raisonné* of its contents is under preparation.

25. In the tea plantation, which is intended to be a source for supplying seed to planters, seven acres have been planted with about 9,000 plants of the China and Assam varieties, and the plants have done well.

26. At the sites for the new Lawrence Asylums 10,300 Eucalyptus trees (blue gum and stringy bark) have been planted out for shelter in masses, bordered by some 6,000 trees of more ornamental kind.

27. The Government have to thank Mr. McIvor for the zeal and energy to which they are indebted for the valuable results recorded in the above Report.

28. His proposal to fix the future price for chinchona plants at one anna each when 5,000 and upwards are taken, and two annas each for any number under 5,000, is approved and sanctioned.

No. 69.

From the Superintendent, Government Chinchona Plantations, to the Acting Secretary to Government, Revenue Department, Fort St. George.

Ootacamund, 25 September 1865.

WITH reference to my letter No. 59, dated 16 August 1865, submitting the Report on the Government Chinchona Plantations and Botanical Gardens for 1864-65, I have the honour to inform you that in consequence of the result of Mr. Howard's analysis of the bark forwarded in May last, I beg to withdraw paragraphs 29 and 30 of the Report above alluded to, as the views set forth in these paragraphs now appear immature, and will require further consideration, and more experience, prior to their being laid before the public.

From the Superintendent, Government Chinchona Plantations, to the Private Secretary to His Excellency the Governor, Ootacamund; dated Ootacamund, 3 October 1865.

I HAVE the honour to enclose a copy of a detailed analysis by J. E. Howard Esq., of Neilgherry Chinchona barks submitted in June last, and request the favour of your being so good as to submit the same to his Excellency the Governor, in order that it may be printed as an Appendix to my Report for 1864-65 on the Government Chinchona Plantations and Botanical Gardens.

Analysis of Chinchona Bark and Leaves. (Received 21 June 1865.)

From the Superintendent of the Government Chinchona Plantations, Ootacamund, to the Secretary to Government, Revenue Department; dated Ootacamund, 3 May 1865.

1. I HAVE the honour to forward, by banghy, a box containing a further supply of chinchona bark, as per Memorandum annexed, for transmission to the Right Honourable the Secretary of State for India, in order that it may be submitted to Mr. Howard for analysis and report.
2. The bark now forwarded was removed from the plants in the early part of April last, or as the sap begins to rise, as at this season the bark separates freely from the wood.
3. Specimens Nos. 2 and 3 are renewed barks; these attain extraordinary thickness in a short period of growth; and if they contain a proportionate quantity of alkaloids, this system of treating the plants appears to offer greater advantages than the other methods proposed.
4. I may observe, that further observation seems to establish that this system of removing strips of bark from the stems of the plants can be practised without injury, provided the wound is instantly covered with damp moss, inattention to covering the wounds having produced the bad effects detailed in my letter of the 17th March 1864.

MEMORANDUM.

Chinchona Succirubra.

No. 1. Bark of three years and five months' growth, thickened by the application of moss.

No. 2. Renewed bark of one year and five months' growth, being reproduced on the same portion of a stem which produced the bark given to Dr. De Vry in November 1863, and from which that gentleman obtained 8.409 per cent. of alkaloid.

No. 3. Renewed bark of one year's growth, and gathered from portions of the stem which yielded No. 1 bark, submitted to Mr. Howard in the spring of 1864.

No. 4. Bark of two years and five months' growth, not thickened by the application of moss.

Chinchona Calisaya.

No. 5. Bark of two years and five months' growth.

Chinchona Condamenia.

No. 6. Bark of one year and seven months' growth

Chinchona Micrantha.

No. 7. Bark of two years and five months' growth, thickened by the application of moss.

No. 8. Ditto of same growth, but not thickened by the application of moss.

(signed) *W. G. McIvor,*

Superintendent of the Government Chinchona Plantations.

REPORT of an Analysis of the Fourth Remittance of Bark from India.

From *J. E. Howard, Esq., F.L.S.,* to the Under Secretary of State for India dated 1 August 1865.

I HAVE the honour to report that I received, and have during the past month devoted much careful attention to the analysis of, eight specimens of bark, referred to in a letter from Madras, dated 3rd May 1865.

The whole of the samples were in excellent condition, showing the care and skill bestowed on their cultivation. They contrasted most favourably with specimens from South America, of bark used at the present moment in the extraction of quinine.

The mode of analysis I have followed, in the present instance, is that which is employed to ascertain the commercial value, which rests almost entirely with the crystallizable sulphates, with perhaps some slight loss of the residuary product. The results will compare well with those given in Delondre's *Quinologie*.

No. 1 gave of cryst. sulphate	- - - - -	6.00
of alkaloid soluble in extra light ether	- - - - -	0.94
of alkaloid insoluble in the above (therefore Chinchonine)	- - - - -	1.06
<i>Memo.</i> —The sulphate refined into white sulphate of quinine in appearance, but this did not stand the test used for commercial sulphate of quinine.		
No. 2 gave of cryst. sulphate	- - - - -	5.00
of alkaloid sol. in E. L. E.	- - - - -	0.90
of alkaloid insol. in E. L. E. (Chinchonine)	- - - - -	1.80
<i>Memo.</i> —Refined as above.		
No. 3 gave of cryst. sulphate	- - - - -	2.72
of alkaloids, sol. in alcohol	- - - - -	7.00
<i>Memo.</i> —As I could only submit to examination 165 grains of the bark, the above result must be taken with reserve.		
No. 4 gave of cryst. sulphate	- - - - -	2.43
of alkaloid sol. in E. L. E.	- - - - -	2.03
of alkaloid insol. in E. L. E. (chinc.)	- - - - -	0.60
<i>Memo.</i> —This specimen gave a product not refining quite so well as No. 1.		
No. 5 gave of cryst. sulphate	- - - - -	0.70
of alkaloid sol. in E. L. E.	- - - - -	0.10
of ditto, ditto, but crystallized by evaporation	- - - - -	0.26
of ditto, insol. in E. L. E. (chinc.)	- - - - -	a trace.
<i>Memo.</i> —This sulphate did not stand the ether test.		
No. 6 gave of cryst. sulphate	- - - - -	0.90
of alkaloid sol. in E. L. E.	- - - - -	0.60
of ditto insol. (chinc.)	- - - - -	a trace.
<i>Memo.</i> —The tests showed quinine and chinchonidine.		
No. 7 gave of cryst. sulphate	- - - - -	5.82
of alkaloid sol. in E. L. E. (aricine)	- - - - -	0.29
of alkaloid insol. in E. L. E. (chinc.)	- - - - -	0.39
<i>Memo.</i> —This sulphate is that of commercial quinidine, and contains probably no quinine.		
No. 8 gave of cryst. sulphate	- - - - -	1.26
of alkaloid sol. in E. L. E.	- - - - -	0.60
of alkaloid insol. in E. L. E. (chinc.)	- - - - -	a trace.
<i>Memo.</i> —The product similar to that of No. 7.		

I beg to direct special attention to the remark, that the fine white crystallized sulphate of quinine, apparently made from the bark of *C. succirubra*, will not stand

stand the test which is employed to distinguish the pure article in commerce. The cause of this I stated in my first report, viz., that "the crystallizations obtained are mixed with sulphate of chinchonidine, which is commercially, but not medicinally, a disadvantage, and one which always attends the products of red bark." It is of course possible to separate the chinchonidine, but then this must very seriously diminish the per-centage of six per cent. I obtained from this gross product little more than four per cent. refined in the first instance (though more subsequently), and of this I ascertained about 10 per cent. as chinchonidine. This difficulty must be looked steadily in the face, and I would suggest that it may be obviated, either by a change being wrought in the opinion of the medical world as to the value of chinchonidine as a medicine, or by the plant being encouraged to produce quinine instead of chinchonidine.

The first might be, very probably, the result of a commission of inquiry composed of competent medical practitioners. I may mention that the late Dr. Royle entered zealously, at my suggestion, into the question, and satisfied himself by experiment as to the value of chinchonidine, but I am not aware that he left any written record of the result he attained. My own experiments confirm this view of the question, and I have shown* that this alkaloid (which must not be confounded with chinchonine) must have constituted, in the whole or in part, the therapeutic agent in the cure of the Countess of Chinchon, as also that it was the alkaloid successfully employed at Philadelphia. The second alternative may seem visionary at first sight, but when we consider the results at which Mr. McIvor has arrived, and, further, the circumstances under which chinchonidine is produced, this view of the case may be altered.

In No. 7 we have an illustration of what careful cultivation will do, as the plant *C. micrantha*, which (with its congeners the grey barks) produces largely and chiefly chinchonine in its native climate of Huanuco,† now produces a very small portion of chinchonidine, and a large quantity of the allied alkaloid, quinidine. This is, then, a hopeful change, if time should confirm the observation.

Then chinchonidine seems almost always to accompany quinine in greater or less abundance. It does so in the Calisaya of Bolivia, in the lancifolia barks of New Granada, and in various barks of Ecuador and Peru, and markedly in the best of the barks of Loxa. It is highly probable that a very slight circumstance in the growth may determine the production of one or other alkaloid. Dr. Herapath has shown, in a communication to the Royal Society, "Researches on the Chinchona Alkaloids," ‡ that the quinine and chinchonidine salts agree closely among themselves, and differ widely from the quinidine and chinchonine compounds.

I may further remark, that the *Chinchona succirubra* is a tree which varies greatly in its products in its native forests, and that the *Chinchona micrantha*, in Bolivia, approaches to the character of a Calisaya, as I have noticed under that head; its bark has a different appearance from that of Huanuco, and again this now sent home varies widely from either of the above. I noticed, in examination, the peculiar yellow colouring matter common, it seems, to all the forms of the plant, as I have before noticed.

The Calisaya bark sent this time by Mr. McIvor is, I fear, an illustration of the possibility of change in the wrong direction, as it contains far too large a per-centage of chinchonidine in proportion to the quinine. The appearance of the bark indicates a not very vigorous growth, or at all events it differs from that it assumes in its native locality. It would never be recognised as the bark of *Chinchona Calisaya*.

The bark No. 6 is recognised by an experienced dealer, as "thin rusty crown, worth 1 s. 3 d. to 1 s. 4 d. per lb." § It is, I presume, the bark of the variety

* "Illustration of Nueva Quinologia, sub. voc. Chahuarguera."

† A peculiar climate, of which I have recorded Mr. Prichett's description under head *C. micrantha*.

‡ Dated 19 June 1857.

§ From Messrs. Jenkin and Phillips to Mr. J. E. Howard:—"51, Lime-street, 21 July 1865: The sample of bark you left with us appears to be thin rusty crown, worth 1 s. 3 d.—1 s. 4 d. per lb. We thank you for the sight of it."

variety Bonplandiana, *i.e.*, the Colorado del Rey, as brought home by Cross: it is remarked as more red than is customary with rusty crown.

As the quantity of bark in No. 1 and No. 4 was not exhausted in my experiments, I have returned 1,000 grains of each of these, thinking that it would be a satisfaction to the Government to engage Dr. de Vry, whose chemical skill and experience are so well known, in further researches on the subject.

ORDER, 31st October 1865.

Ordered, that the above letters be printed as Appendices to Mr. McIvor's letter, No. 59, dated 16th August 1865, submitting his Report on the Government Chinchona Plantations for 1864-65, recorded in G. O., dated 27th September 1865, No. 2325

(signed) *W. Hudleston,*
Acting Secretary to Government.

— No. 70. —

From the Government of Madras to the Secretary of State for India.

Madras, 25 December 1865.

* Proceedings
of Government, 22
December 1865,
Nos. 237 to 240.

WE have the honour to forward, for your information, our Minutes and Order, marginally noted, on the condition of the Chinchona plantations, when visited by our President in October last. His Excellency's account of the present state of the different plantations will, we feel sure, be extremely gratifying to you.

2. The receipt, since these Minutes were penned, of your Despatch dated 30th September (No. 27, Public), has led us to postpone the consideration of the extent to which our operations shall be carried on. We shall reply separately to that Despatch, and meanwhile no change will be made without your sanction.

3. The construction of roads to the plantations will be carried on as rapidly as practicable, and if sufficient funds are not available from our ordinary Budget grant, we shall apply for a special grant, feeling certain that it is your wish that these very necessary works should be prosecuted with energy.

Enclosure in No. 70.

MINUTE by Sir *William Denison*, 30 October 1865.

1. DURING my visit to the Hills I have inspected the different Chinchona plantations, have made myself acquainted with the position, extent, present state, and means of development of each, and have, with the aid of the facts brought before the Government in the annual reports of Mr. McIvor, and especially in that of 1864-65, been able to arrive at the actual amount expended upon each of the plantations, while the analysis, by Mr. Howard, of the specimen of bark furnished to him from the different plantations, affords fair evidence of the quality of the material which the Government will be able to furnish. The only question, therefore, which remains undetermined, is the probable quantity of the yield per acre, and the return which the cultivation of the plant, under favourable condition as regards soil, exposure, moisture, &c., is likely to make for the capital expended upon it.

2. I will now proceed to lay before the Government the results of my observations, and to make such suggestions as may lead to the determination of the facts as regards the quantity of the annual returns, which remain as yet hypothetical, and to recommend the adoption of measures which will, I think, tend to encourage the application of private capital to the cultivation of Chinchona.

3. The first plantation which I visited was that in connection with the Botanic Garden at Octacamund. It will be remembered that, at the commencement of the experiments upon the cultivation of Chinchona, there was a difference of opinion between Mr. McIvor and Drs. Anderson and Macpherson as to the proper treatment of the plant; these latter gentlemen affirming that, in accordance with the example set by the Dutch in Java, the young plants should be placed under the shelter of older trees, while Mr. McIvor expressed an opinion that they would flourish better in situations exposed to the ordinary influences of the sun and atmosphere. The Government, in the absence of any positive information, decided that the two theories should be tested; that a certain number of acres of forest should be planted with Chinchona, while, as a general rule, the cultivation in the open should be adopted.

4. This

4. This was accordingly done. About 50 acres of forest, or what is termed the Dodabet plantation, in the immediate vicinity of the gardens, were planted with different species of Chinchona, while elsewhere the forest has been felled and burned, and the young Chinchona plants have been substituted for the forest trees. The present state of the Dodabet plantation is conclusive as to the propriety of adopting the system advocated by Mr. McIvor, for while in those portions of it where the Chinchona has been planted under the shelter of the forest, the plants are dwarfed, stunted, and exhibit but a very slight tendency to develop into trees: in situations identical, as regards soil, height, and aspect, but where the only difference is the absence of shelter, they are growing rapidly, and are strong, healthy, and well developed. The result, therefore, of my observation is conclusive as to the propriety of the course adopted by the Government at the suggestion of Mr. McIvor, in ordering the clearance of the forest from this plantation, a few acres, say 10, being left as evidences of the working of the two systems.

5. On the opposite slope of the same range of Dodabet Hills, and consequently with a different aspect, upwards of 700 acres of land have been reserved by the Government for the extension of this plantation; of these 350 acres have been cleared of timber, a portion of which has been planted with Chinchona, while, at the bottom of the forest land, a portion of grass land has been pared, cleaned, and planted, and the plants there appear to be doing as well as those which occupy the cleared portion of the forest.

6. The second plantation which I visited was that at Mailkoondah, on the eastern or north-eastern slope of the Koondahs. I experienced a good deal of difficulty in reaching the site of this plantation, which is in the heart of a forest of about 10,000 acres. When I arrived at the site, I found that little had been done beyond clearing about 170 acres of land, building a house for the superintendent, some huts for the labourers, and commencing a gaol for the prisoners by whose labour, principally, it is proposed to bring this plantation into cultivation. Were it the sole object of the Government to procure a supply of Chinchona bark for its own purposes, I should not have been disposed to recommend the maintenance of this plantation; but looking to the fact that the soil is far more rich than that of any of the other plantations, that there are several thousand acres of equally valuable land in the immediate vicinity, that the plantation will form a nucleus round which planters will congregate, I am inclined to recommend that it should be maintained, and that a good road should be opened to it with as little delay as possible. The Government has reserved at this site some 2,500 acres; but this is far in excess of its wants. I should recommend the retention of 500 acres, and that the rest should be thrown open to the public.

7. The third plantation which I visited was that at Pykara. In its present state this consists—

First. Of 40 acres, planted to the right and left of the road leading down by the side of the river from the upper to the lower falls. The difference of level, between the superintendent's house at the top of the hill and the dwellings of the labourers at the garden, is said to be about 2,000 feet.

Second. Of about 100 acres of land on the eastern and north-eastern slopes of the Neilgherries, looking into Mysore, of which about 60 are planted, and the remainder are cleared and in a state to be planted early next season.

Third. Of a tract of land on the opposite or left bank of the Pykara River, which Mr. McIvor has commenced to clear, and a portion of which will be ready for planting early next year. The land on the right bank of the river is very stony, and portions of it are dry; the plants, however, seem to be doing well. I was not able to get across the river to the ground under clearance, but I was told by Mr. McIvor that the soil was superior to that on the opposite bank.

8. The fourth plantation which I visited was the principal one at Neddivuttum. This was commenced in 1861, and about 27,000 plants were put out during the rainy season of 1862. The quantity of land actually planted with Chinchona is about 300 acres, but additional portions have been cleared, much of which is ready to receive plants. The whole plantation, where the land now cleared is occupied, will comprise an area of 500 acres. Nothing can look better than the plants which have been three years in the ground. They were placed at distances of 10 and 12 feet apart, which experience has shown to be farther than necessary; 7 feet apart, which, including the area taken up by drains, path-roads, &c., will give about 800 plants to the acre, is the distance now adopted. The three year old plants are 10 or 11 feet high, have stems 9 or 10 inches in circumference, and they throw out branches forming a large head. Notwithstanding the effects of a violent gale and a hail storm which had visited the plantation a few days before my arrival, and which had stripped off a good many leaves, the plants looked remarkably well. Where, however, the wind had the power of sweeping up the valleys, it showed evidence of its action in branches broken and bark rubbed off.

9. I inspected carefully several plants which had been cut down last year, a few days previous to my visit, and was gratified to find that most of them had thrown up fresh shoots, which, in the course of twelve months, had attained a height of full three feet, and exhibited a joint circumference very much in excess of that which the parent plant would have attained to. I was the more gratified to see this as it strengthened an opinion I had already formed as to the possibility of treating the Chinchona plantations as coppice-wood is dealt with in England, that is, by cutting it down when the annual development of bark has arrived at its maximum, say, every five or six years. The period during which the

coppice-wood must be allowed to grow would of course have to be determined by experience, and I now suggest that a series of experiments should be made for the purpose of furnishing the Government with data upon which the probable annual returns may be calculated.

10. It has already sanctioned an experiment suggested by Mr. McIvor, viz., that of stripping off a portion of the bark of each tree over an area of about 10 acres, and I think it would be advisable to cut down this year, say, three acres of the three-year old plants, allowing them to throw up shoots from the stools, and to carry on the process annually over about the same area, so as to arrive, by direct experiment, at satisfactory information—

First. As to the value of the yield in favourable situations of an acre of a given species of Chinchona, three or four years old.

Second. As to the annual rate at which the bark increases on the tree.

Third. As to the per-centage of alkaloids in bark of different ages.

Fourth. As to the most profitable mode of treating the plant as a produce of bark.

11. Mr. McIvor is experimenting largely upon the effect of covering the bole of the trees with moss, both as a means of increasing the thickness and weight of bark, and of adding to the quantity of the alkaloids contained in a given weight. He deserves every credit for the zeal and energy with which he has applied himself to the study of the subject of the production of these alkaloids, and for the skill with which he has devised experiments for the purpose of illustrating his views. The result of these experimental inquiries will, in all probability, be evidenced by a large increase in the annual value of the return from the plantations.

12. I will now say a few words as to the work which remains to be done, both at the plantations themselves and in improving the means of communication with them; before, however, I can express any opinion as to the work which remains to be done, the Government must come to some decision as to the extent of land which it is prepared to bring under cultivation.

13. I have said before that at Neddiwuttum about 300 acres of land are planted, and 200 more will be ready to plant in the course of next year and the year after; these 500 acres will absorb nearly all the land within the existing limits, and I should not be disposed to add to this quantity. At Pykara 100 acres are planted, 60 acres are prepared, and some 80 or 90 acres are in course of preparation, while there is land of good quality which would admit of an extension of 200 acres, without pushing the clearance beyond the spot which it has now reached; if thus the plantation at Pykara be limited at present to 250 acres of Chinchona, and, say, 300 acres of land additional to this, it will, in my opinion, be quite sufficient, and I should recommend that the land reserved by Mr. McIvor, in excess of this amount, should be thrown open for selection to the public. At the Dodabet plantation there are 75 acres already planted; there are the means of extending this to 250 acres, and this would be sufficient for all the purposes of the experiment. The reserve of 750 acres to the east of the hill is more than can be ever required, and I should be disposed to recommend that 300 acres, in addition to the 250 acres planted, should be reserved by the Government, and that the rest should be sold. Mr. McIvor should be called upon to mark out the boundaries of the land he wishes to reserve, to the amount of 300 acres or thereabout, in addition to the planted land, and the remainder should be sold in one or two blocks, as convenient, without reference to its position, should it be within the limits of the cantonment. At Mailkoondah, as stated above, 2,500 acres have been reserved; I should limit the amount of cultivation here to 200 acres, and the whole area of land within the Government boundary to 500 acres.

14. It will be seen, with reference to the above figures, that the amount of land under cultivation will be as follows:

Neddiwuttum - - - - -	Acres.	500
Pykara - - - - -		250
Dodabet - - - - -		250
Mailkoondah - - - - -		200
		<hr/> 1,200
To this will be added, say, as a reserve—		
Neddiwuttum - - - - -		100
Pykara - - - - -		300
Dodabet - - - - -		300
Mailkoondah - - - - -		300
		<hr/> 1,000
The total area will be of—		
Neddiwuttum - - - - -	500 + 100 =	600
Pykara - - - - -	250 + 300 =	550
Dodabet - - - - -	250 + 300 =	550
Mailkoondah - - - - -	200 + 300 =	500
		<hr/> 2,200
Making a Total of Acres		

The first thing to be done, as soon as the area of the different plantations, present and future, is decided, is to have a plan on a large scale made of each. The Government ought to be in possession of a plan of its own estate, and the public ought to know where the appropriated land ends and that begins which is open to selection. Instruction should be given to the surveyor to enclose the plantation within straight lines, and to give the figure of the enclosed portion as few sides as possible; his work will be rendered much easier by this, which ought to be laid down as a rule to guide surveyors in general. The boundaries will be more easily marked, and any man will be able to determine for himself the area of land which will include the amount which he wishes to purchase.

15. The next thing to be done is to lay out roads, by which the produce of the plantation and the stores for the maintenance of the men can be easily conveyed to and from the market. From Neddiwuttum, for instance, when the plantation is in full bearing, about 100 acres will be cut down every year, and the produce of each acre may be put roughly at one ton of bark, so that 100 tons will have to be moved to market every year; the same rule will apply to the other plantations. The new trace from Neddiwuttum to Ootacamund, which will answer as the line from the Goodaloor Ghaut, will answer every purpose of the establishment, and should be completed as fast as the means at the disposal of the Government will permit. From Pykara a branch requires to be made to join the above new trace; it may be a matter of question whether this should be carried upon the right or the left bank of the river. A bridge must at all events be made at some point between the upper and the lower fall, to enable the superintendent to cross the river at all seasons.

16. To Mailkoonlah a new road must be opened with as little delay as possible. I have been told that there is a fair line from the Devi Shola, following down a line of watershed to the stream which flows into the Bowaney, and that a similar watershed will be found on the opposite side leading up to the Kuondaha. I have spoken on the subject to Major Farewell, and directed him to turn his attention to this line of road at once, as it is of special importance that it should be opened out with as little delay as possible. It would be advisable to place on the estimates for the next year such a sum as would be sufficient to push forward such of these roads as are of the most importance, and specially to provide for the construction of the bridge over the affluent of the Bowaney, which should be of a solid description, for the floods come heavily down this river, and the whole communication with the Government and the other plantations will depend upon this bridge.

(signed) *W. T. Denison.*

30 October 1865.

— No. 71. —

From the Conservator of Forests to the Acting Secretary to Government,
Revenue Department, Fort Saint George.

Bombay, 30 October 1865.

1. I **BEG** to report my return to duty yesterday, with the permission of the Right Honourable the Secretary of State for India, and my intended departure in two days for Madras.

2. Mr. Clements Markham, to whom we are indebted for the introduction of the Chinchona plants from South America, is here, and proceeds by the same steamer (upon 1st proximo) to inspect the Chinchona plantations in Ceylon, and thence, *via* Courtallum and Cochin, to the Neilgherries. He has expressed a wish that I should accompany him.

3. It was proposed by the Government in 1860 that I should visit Ceylon, on duty, but this was not accomplished, as my services were soon after required in the Punjab. I have not visited the Tinnevely Hills, and believe that it might be to the advantage of the department in which I have the honour to serve if Mr. Markham and I were associated at this time.

4. If this proposal should meet with the approval of His Excellency the Governor, I request the favour of a telegram to await arrival at Calicut on 4th proximo, to enable me to arrange my movements accordingly.

— No. 72. —

ORDER of the Madras Government.

8 November 1865.

DR. CLEGHORN has been already informed by telegram that the Government cannot sanction his proceeding to Ceylon on duty. His return to duty will be gazetted.

— No. 73. —

EXTRACT of a LETTER from Mr. *Clements Markham* to the Under Secretary of State for India.

Sir,

Guindy Park, Madras, 14 February 1866.

IN continuation of my letter, dated at Ootacamund on 26th December 1865, I now have the honour to report my subsequent proceedings up to 10th February, the day on which I arrived at Madras.

2. I was occupied, during my stay in the Neilgherries, in inspecting the Chinchona plantations, trying experiments on the bark, and discussing numerous questions of detail, in the cultivation, with the superintendent. I have since submitted my views on the whole subject for the consideration of the Government of Madras in a report, a copy of which has already been forwarded to your address by the Secretary to the Government of Madras in the Revenue Department.* It will, in due course, be submitted for the consideration of the Secretary of State in Council, together with the minutes and orders of the Madras Government; and I therefore defer any further remarks bearing on the recommendations contained in it for the present.

* An uncorrected proof.

3. I may be permitted, however, to give expression to the great pleasure I experienced on seeing the results of my labours, representing as they do so complete and undeniable a success. When I selected the sites for plantations in 1860-61, they were covered with dense jungle. Now the scene is so altered as to be beyond recognition: acres of ground are covered with rows of Chinchona trees, with their lustrous crimson-veined leaves and fragrant flowers; and in one place they have grown to such a size that the foliage of their branches mingles and entirely conceals the ground. They have become so important and distinctive a feature of the fine range which overhangs the Moyar Valley, that it should be known henceforth as the Chinchona mountains.

4. Private enterprise on the Neilgherries is following close on the heels of the Government operations. Mrs. Morgan has an establishment for propagating and distributing Chinchona plants. Mr. Money is opening a fine estate of 500 acres in the Deva-sholah, the largest forest on the Neilgherries. Colonel Fyers has an estate on the Koondahs; Colonel Denison and Captain Jennings have commenced planting near Ootacamund; the Carnatic Company above Neddiwuttum; Colonel Scott at Mailloor; Mr. Grove and Mr. Morgan near the Pycarrah Falls; Dr. Colvin Smith and others at Kotergherry; and of the 85 persons who have purchased land on the Neilgherry Hills, under the Waste Land Rules of 6th March 1863, as many as 50 have undertaken Chinchona cultivation. The species thriving at high elevations will soon cover hundreds of acres of land on the Neilgherry plateau.

Enclosure No. 1.

5. I enclose a list of purchasers of land on the Neilgherry Hills, under the Waste Land Rules, with the localities, and the extent of each purchase. The total area purchased from Government amounts to upwards of 8,000 acres.

6. I left the Neilgherry Hills on the 16th of January to visit the important district of Wynaad, by way of Calicut, the Nelemboor teak plantations, and the Carcoor Ghaut. My object was to judge of the capabilities of Wynaad as a Chinchona yielding district, to ascertain the exact extent that the cultivation has been or is likely to be undertaken by the planters, and to collect information which would enable me to recommend some measure to the Government with a view to its spread amongst native cultivators.

7. I have

7. I have since submitted a report on the subject, in continuation of paragraph 40 of my former report. An admirable proposal, made by the Collector of Malabar, to spread Chinchona cultivation widely in the gardens and small holdings of the native Wynaad proprietors, had been rejected by the Madras Government in 1864. Their decision is much to be deplored, as it has thrown back the spread of bark cultivation, in the most feverish district in the Presidency, for two years. But I still hope that my report may induce the Government to reconsider their refusal to allow the fever-stricken people of Wynaad to be supplied with Chinchona plants. I enclose a copy of Mr. Ballard's letter on the subject.

Enclosure, No. 2.

8. While engaged on my special duty connected with Chinchona cultivation I rode backwards and forwards over every part of the Wynaad district, examined all the roads, whether Imperial or district, and endeavoured to collect all available information as to the requirements of this great centre of European and native planting operations. I rode on an average 30 miles a day, under a blazing sun, at a time when fever was raging, for 16 days; and spared no pains to obtain accurate information on all points, by careful personal inspection, and by conversations with Government officials and with planters. I have embodied my observations in a report, which I shall forward to your address as soon as it is completed.

9. I am happy to be able to report that the Rajah of Travancore has cordially adopted our recommendations with reference to the Chinchona establishment at Peermede.

Enclosure 1, in No. 73.

LIST OF LANDS Purchased on the Neilgherry Hills, under the Waste Land Rules of 6 March 1863.

Number.	NAME OF PURCHASER.	Extent in Acres.	LOCALITY.
1	Messrs. Vincent and Dr. Tacien - - -	50	Kartairy.
2	Mr. H. R. Grimes - - - - -	20	Sentinel Rock.
3	Mr. W. Mullaly - - - - -	300	Chengal & Coomal Valley.
5	Nunjapa Rao - - - - -	100	Coonoor.
6	Mr. W. Mullaly - - - - -	200	Neerally Valley.
7	Mr. J. Hayne - - - - -	50	Droog Hill.
8	Mr. T. Stanes - - - - -	80	Burlyar.
9	Mr. J. Hunter - - - - -	300	Pilloor Valley.
10	Ditto - - - - -	47	Ditto.
11	Ditto - - - - -	185	Ditto.
12	Captain W. Daly - - - - -	6	Kalhutti.
13	Major C. P. Taylor and Colonel Denison -	200	Ootacamund.
14	Major E. L. Grant - - - - -	30	Wellington.
15	Mr. J. H. Schnarri - - - - -	300	Koondahs.
16	Mr. C. E. Eckersall - - - - -	5	Ootacamund.
17	Mr. A. L. Brown - - - - -	150	Kodanaad.
18	Ditto - - - - -	150	Ditto.
19	Mr. H. R. Grimes - - - - -	500	Orange Valley.
20	Ditto - - - - -	500	Ditto.
21	Mr. Herklots - - - - -	200	Nerally.
22	Mr. Robinson - - - - -	15	Kotagherry.
23	Reverend DeGelis - - - - -	2	Coonoor.
24	Mr. T. Kay - - - - -	40	Ditto.
25	Lieutenant Jennings - - - - -	180	Ootacamund.
26	Mr. H. R. Dawson - - - - -	250	Nellapatam.
27	Commander Mitcheson - - - - -	250	Munjasombay.
28	Captain Fuller - - - - -	300	Moolasapey.
29	Mr. E. Smith - - - - -	7	Coonoor.

List of Lands Purchased on the Neilgherry Hills, &c.—*continued.*

Number.	NAME OF PURCHASER.	Extent in Acres.	LOCALITY.
30	Dr. Rogers	20	Ootacamund.
31	Mr. C. Sanderson	200	Coonoor.
32	Mr. R. F. Phillips	200	Kodanaad.
33	Ditto	50	Ditto.
34	Ditto	50	Ditto.
35	Major C. P. Taylor	20	Ootacamund.
36	Major H. Sweet	125	Colcombay.
37	Dr. J. Miller	11	Ootacamund.
38	Mr. F. A. Groves	20	Pycarra.
39	Colonel Dobbie	10	Ditto.
40	Colonel Woods	5	Ootacamund.
41	Mr. Money	500	Deva Shola.
42	Mr. J. H. Findlay	50	Kodanaad.
43	Ditto	30	Ditto
44	Mr. E. B. Thomas	200	Ditto.
45	Mr. R. F. Phillips	50	Ditto.
46	Ditto	2	Coonoor.
47	Reverend DeGelis	1	Ditto.
48	Major Grant	30	Ditto.
49	Mr. E. B. Thomas	2	Ditto.
50	Mr. J. Morgan	300	Pycarra.
51	Captain Gerrard	5	Coonoor.
52	Captain Fuller	2	Keelkotagherry.
53	Mr. Brown	25	Kodanaad.
54	Major C. P. Taylor	50	Ootacamund.
55	Dr. Stewart	37	Ditto.
56	Mr. Misquith	50	Ditto.
57	Major C. P. Taylor	20	Ditto.
58	Colonel Young	4	Coonoor.
59	Mr. Wait	15	Ditto.
60	Dr. Stewart	80	Ootacamund.
61	Colonel Denison	150	Ditto.
62	Major Morgan	30	Ditto.
63	Mr. Ouchterlony	9 ³ / ₈	Ditto.
64	Mr. Hill	0 ¹ / ₁₆	Coonoor.
65	Mr. Liddell	13	Ootacamund.
66	Mr. Story	20	Coonoor.
67	Captain Berkeley	9	Ditto.
68	Theeroovengdum	30	Ootacamund.
69	Mr. R. F. Phillips	3	Coonoor.
70	Mr. Reily	2	Ditto.
71	Carnatic Coffee Company	200	Pycarra.
72	Mr. R. F. Phillips	150	Koondahs.
73	Mr. Warburton	60	Ootacamund.
74	Mr. Moss	40	Ditto.
75	Mr. Granaburnum	10	Ditto.
76	Kristnasawmy	20	Ditto.
77	Captain Berkeley	20	Coonoor.
78	Mr. C. Sanderson	30	Ditto.
79	Mr. S. Davis	10	Ditto.
80	Mr. T. Stanes	6	Ditto.
81	Mr. Stonehewer	1	Ditto.
82	Mr. Gerrard	4	Ditto.
83	Colonel Cooper	66	Kotagherry.
84	Mr. J. Allamby	50	Ootacamund.
85	Colonel Scott	300	Teimullay (Mailloor).
	TOTAL	8,075	

— No. 74. —

From the Government of Madras to the Under Secretary of State for India.

Madras, 6 February 1865.

We have the honour to forward for your information the accompanying Tabular Report on the number, condition, &c., of the Chinchona plants on the Neilgherries, on the 31st December 1865.

Enclosure in No. 74.

REPORT on the Number, Distribution, and Condition of Chinchona Plants on the Neilgherries, on 31 December 1865.

Species.	Botanical Names.	Commercial Names.	Number of Plants.	Value per Lb. of Dry Bark in the London Market.		REMARKS.
				s. d.	s. d.	
1	<i>C. succirubra</i> - -	Red Bark - -	284,276	2 6	to 8 9	The number of plants planted out in the plantations remain the same as in last month, namely, 244,871. The increase by propagation is 53,403, being 1,548 above the average of the last six months, making the total number of plants 941,257.
2	<i>C. Calisaya</i> , var. <i>Fru-tex</i> , var. <i>vera</i> .	Yellow Bark - -	3,166	2 10	to 7 -	
3	<i>C. officinalis</i> , var. <i>Con-daminea</i> (<i>C. Uritu-singa</i>).	Original Loxa Bark -	8,189	2 10	to 7 -	
4	<i>C. officinalis</i> , var. <i>Bon-plandiana</i> (<i>C. Cha-huarguera</i>).	Select Crown Bark -	611,488	2 10	to 7 -	
5	<i>C. crespilla</i> - -	Fine Crown Bark - -	3,879	2 10	to 6 -	
6	<i>C. lanceifolia</i> - -	Pitayo Bark - -	159	1 8	to 2 10	
7	<i>C. nitida</i> - -	Genuine Grey Bark -	2,786	1 8	to 2 9	
8	<i>C. Species without name.</i>	Fine Grey Bark -	8,500	1 8	to 2 10	
9	<i>C. micrantha</i> - -	Grey Bark - -	15,010	1 8	to 2 9	
10	<i>C. Peruviana</i> - -	Finest Grey Bark -	3,359	1 8	to 2 10	
11	<i>C. Pahudiana</i> - -	Unknown - -	425	Unknown.		
TOTAL Number of Plants. - - -			941,257			

TABLE II.

MEMORANDUM of the Growth of Eleven Plants of *C. succirubra*, planted on the Second Denison Plantation, at Neddivuttum, on 30 August 1862.

Number of Plants.	Height in Inches when Planted on 30 August 1862.	Height in Inches on 30 November 1865.	Height in Inches on 31 December 1865.	Growth in Inches during December 1865.	By whom Planted.
1	23	129½	131	1½	His Excellency Sir W. Denison.
2	16½	115½	117½	1½	
3	19	116½	119	2½	
4	15	110½	110½	-	J. W. Breeks, Esq.
5	27	134	134½	½	
6	20	107½	107½	½	Dr. Sanderson.
7	20	119	122	3	
8	18	123½	124½	½	J. D. Sim, Esq.
9	20	128	129½	1½	
10	20	129	130½	1½	Lieutenant McLeod.
11	18	111	112½	1½	
12	-	78½	82	3½	P. Grant, Esq.
					Plant cut down for bark.

TABLE II. exhibits the growth of 11 plants of *C. succirubra* planted out by his Excellency the Governor and other gentlemen at Neddivuttum on the 30th August 1862. The average growth of these plants during the month is 1½ inches, or about the same as last month.

One of the two plants cut down on the 20th of March 1863 for the bark, submitted to Mr. Howard for analysis, has made strong shoots of 82 inches in height, giving the growth of 3½ inches during the month.

TABLE III.—SHOWING the Height of Twelve Plants of *C. officinalis*, planted on the Dodabetta Plantation at Ootacamund, on 30 September 1863.

Number of Plants.	Height in Inches when Planted on 30 September 1863.	Height in Inches on 30 November 1863.	Height in Inches on 31 December 1865.	Growth in Inches during December 1865.	REMARKS.
1	19	103½	106½	3	The twelve plants of <i>C. officinalis</i> (a shrubby species) on the Dodabetta Plantation gives an average growth of 3 inches, or ⅓th of an inch under the growth of last month.
2	14½	93	95	2	
3	28	103½	107	3½	
4	22	101	103½	2½	
5	21½	103½	107	3½	
6	28	117	119½	2½	
7	22½	98½	101	2½	
8	21½	97	100½	3½	
9	21½	109½	113	3½	
10	19½	101½	104½	3	
11	24	106	109½	3½	
12	24	105	108	3	

TABLE IV.—REGISTER of Chinchona Plants Distributed.

NAMES.	STATION.	Number of Plants.
Mr. F. N. Maltby - - - -	Travancore - - - -	16
Dr. Junghuhn - - - -	Java - - - -	56
Mr. A. R. Lascelles - - - -	Ootacamund - - - -	12
Mr. M. Anderson - - - -	Jamaica - - - -	2
Dr. Wiche - - - -	Bombay - - - -	10
Dr. T. Anderson - - - -	Calcutta - - - -	554
Dr. Jamieson - - - -	Saharanpore - - - -	107
Professor Lees - - - -	Calcutta - - - -	547
Rajah of Travancore - - - -	Travancore - - - -	521
Major Morgan - - - -	Ootacamund - - - -	1,534
Mr. E. T. Fitzgerald - - - -	Calcutta - - - -	558
Mr. J. W. B. Money - - - -	- ditto - - - -	1,369
Mr. W. Bourne - - - -	- ditto - - - -	532
Captain Cox - - - -	Wynad - - - -	6
Mr. Hollock - - - -	- ditto - - - -	2
Mr. T. Sheffield - - - -	Ootacamund - - - -	12
Dr. F. Day - - - -	Cochin - - - -	100
Mr. Brown - - - -	Tellicherry - - - -	12
Mr. J. Hall - - - -	Ootacamund - - - -	144
Mr. T. Knop - - - -	- ditto - - - -	18
Captain Lees - - - -	Bengal - - - -	281
Mr. W. H. Rayne - - - -	Manantoddy - - - -	424
Rev. — Sawyer - - - -	Ootacamund - - - -	1,018
Mr. Frend - - - -	- ditto - - - -	512
Mr. Hollock - - - -	- ditto - - - -	1
Mr. J. Pierie - - - -	Seegoor - - - -	12
Colonel Scott - - - -	Ootacamund - - - -	1,236
Mr. Berend - - - -	Cachar - - - -	275
Rev. J. Hunter - - - -	Coonoor - - - -	12
Mr. J. Mullaly - - - -	- ditto - - - -	24
Mr. W. H. Stanes - - - -	- ditto - - - -	1,262
Colonel R. Cooper - - - -	Kotagherry - - - -	12
Mr. F. Cockburn - - - -	- ditto - - - -	12
Colonel Woodfall - - - -	Coonoor - - - -	12
Mr. C. Anderson - - - -	- ditto - - - -	24
Colonel Angelo - - - -	Ootacamund - - - -	12
Rev. E. Laceron - - - -	- ditto - - - -	12
Captain R. N. Taylor - - - -	Coorg - - - -	96
Major W. Agnew - - - -	Assam - - - -	139
Mr. V. H. Levinge - - - -	Madura - - - -	12
Chief Commissioner of - - - -	Nagpore - - - -	28

The total number of plants distributed is 83,676.

TABLE IV.—Register of Chinchona Plants Distributed—*continued.*

NAMES.	STATION.	Number of Plants.	REMARKS.
Mr. Fletcher - - - -	Ootacamund - - -	24	
Gool Mahomed - - - -	- ditto - - - -	20	
General McCleverty - - - -	New Zealand - - -	23	
Mr. W. Robinson - - - -	Kotagherry - - -	330	
" Crake - - - -	Wynad - - - -	12	
" H. R. Dawson - - - -	Seegoor - - - -	12	
Captain Mann - - - -	Coorg - - - -	48	
Mr. E. Roberts - - - -	- ditto - - - -	530	
" H. Russell - - - -	Wynad - - - -	52	
Rev. — Wait - - - -	Coonoor - - - -	2	
Collector of Belgaum - - - -	Belgaum - - - -	28	
" " Honors - - - -	Honore - - - -	28	
Dr. Ross - - - -	- ditto - - - -	15	
His Excellency the Governor - - - -	Bombay - - - -	158	
Mr. H. Hinde - - - -	Wynad - - - -	12	
" E. B. Thomas - - - -	Coonoor - - - -	74	
Rajah of Poonganoor - - - -	Poonganoor - - -	12	
Major Grant - - - -	Wellington - - -	226	
Messrs. Thomson, Shaw & Co. - - - -	Poonganoor - - -	28	
Mr. J. H. Trinson - - - -	- ditto - - - -	31	
Dr. Muller - - - -	Melbourne - - -	28	
Mr. Tyrrell - - - -	Mysore - - - -	12	
Dr. Sayers - - - -	Vellore - - - -	12	
Major C. P. Taylor - - - -	Ootacamund - - -	5,250	
Dr. Wilson - - - -	- ditto - - - -	6	
Mr. Schnarrie - - - -	- ditto - - - -	15,000	
Captain Fuller - - - -	Coonoor - - - -	417	
Dr. Drummond - - - -	Ootacamund - - -	224	
Captain Jennings - - - -	- ditto - - - -	1,756	
Lieut. H. B. Montmorency - - - -	Bangalore - - -	6	
Mr. McHutchin - - - -	Ootacamund - - -	3	
Colonel Molesworth - - - -	- ditto - - - -	6	
Mr. C. Gray - - - -	Coonoor - - - -	12	
" H. B. Leddell - - - -	Ootacamund - - -	12	
" Minchin - - - -	Wynad - - - -	1,600	
His Excellency the Governor - - - -	Vizagapatam - - -	35	
Mr. R. F. Phillips - - - -	Kotagherry - - -	1,117	
Colonel Cooke - - - -	- ditto - - - -	24	
Mr. G. J. Glasson - - - -	Wynad - - - -	1,000	
Dr. Macpherson - - - -	Mercara - - - -	400	
Mr. W. H. Kerr - - - -	Coorg - - - -	3,100	
" James - - - -	Ootacamund - - -	1,000	
Colonel Whish - - - -	Bengal - - - -	82	
Mr. K. Mair - - - -	Calcutta - - - -	1,180	
" W. Shakespear - - - -	- ditto - - - -	61	
" E. E. Meakin - - - -	- ditto - - - -	168	
" C. Ackland - - - -	- ditto - - - -	150	
" K. McIver - - - -	- ditto - - - -	124	
" Havelock - - - -	Ootacamund - - -	12	
" H. de Facien - - - -	Kartaury - - - -	6,821	
Major Sweet - - - -	- ditto - - - -	910	
Captain Campbell - - - -	Bangalore - - -	6	
Royal Gardens - - - -	Mauritius - - - -	36	
Honourable W. R. Arbuthnot - - - -	Wynad - - - -	93	
Mr. H. Maxwell - - - -	Bombay - - - -	50	
Mrs. C. Smith - - - -	Wynad - - - -	316	
Captain Beckley - - - -	Wellington - - -	200	
Mr. Walsh - - - -	Salem - - - -	100	
His Excellency the Governor General - - - -	Java - - - -	175	
Captain Richardson - - - -	Kulbutty - - - -	509	
Rajah of Poonganoor - - - -	Poonganoor - - -	24	
His Excellency the Governor - - - -	Madras - - - -	24	
Mr. J. W. B. Money - - - -	Ootacamund - - -	25,000	
Captain Mitcheson - - - -	- ditto - - - -	50	
Mr. R. H. Elliot - - - -	Munjerabad - - -	157	
His Excellency the Governor General - - - -	Goa - - - -	252	
Colonel Phayre - - - -	Rangoon - - - -	152	
Mr. Ryall - - - -	Kotagherry - - -	24	
" J. Gordon - - - -	Coonoor - - - -	1,701	
" J. Rohde - - - -	Neddivurtum - - -	100	
" J. Higginbotham - - - -	Goodaloor - - -	12	

TABLE IV.—Register of Chinchona Plants Distributed—*continued*.

NAMES.	STATION.	Number of Plants.	REMARKS.
Mr. S. Pitol - - - - -	Mauritius - - - - -	36	
„ J. Horne - - - - -	ditto - - - - -	36	
„ Edward Cremary - - - - -	Reunion - - - - -	51	
For the French Government - - - - -	Algiers - - - - -	45	
Mr. J. B. Norton - - - - -	Shevaroy - - - - -	50	
„ Mackay - - - - -	Punjab - - - - -	50	
„ W. Forsyth - - - - -	Central Provinces - - - - -	169	
Colonel Cadell - - - - -	Coorg - - - - -	62	
Mr. J. L. Browning - - - - -	Wynad - - - - -	4	
„ H. Leeds - - - - -	Burmah - - - - -	112	
Maloo Sait - - - - -	ditto - - - - -	6	
Mr. A. D. Brown - - - - -	Dimhatty - - - - -	53	
„ J. C. Misquith - - - - -	Ootacamund - - - - -	300	
TOTAL Number of Plants - - - - -		83,676	

Ootacamund,
17 January 1866.

(signed) *W. G. McIvor*,
Superintendent, Government Chinchona Plantations.

— No. 75. —

From the Government of Madras to the Secretary of State for India.

Madras, 10 March 1866.

WE have the honour to forward, for your information, the accompanying Tabular Report on the number, condition, &c., of the Chinchona plants on the Neilgherries on the 31st January 1866.

Enclosure in No. 75.

REPORT on the Number, Distribution, and Condition of Chinchona Plants on the Neilgherries, on the 31st January 1866.

No. of Species.	Botanical Names.	Commercial Names.	Number of Plants.	Value per Lb. of Dry Bark in the London Market.		REMARKS.
				s. d.	s. d.	
1	<i>C. succirubra</i> - - -	Red Bark - - -	288,477	2 6	to 8 9	The number of plants planted out in the plantations remain the same as in last month, namely, 214,871.
2	<i>C. Calisaya</i> , var. <i>Frutex</i> , var. <i>Vera</i> .	Yellow Bark - - -	3,156	2 10	to 7 -	
3	<i>C. officinalis</i> , var. <i>Condaminea</i> (<i>C. Uritusinga</i>).	Original Loxa Bark -	8,269	2 10	to 7 -	
4	<i>C. officinalis</i> , var. <i>Bonplandiana</i> (<i>C. Chahuarguera</i>).	Select Crown Bark -	649,552	2 10	to 7 -	The increase by propagation is 42,894, being 11,082 under the average of the last six months, making the total number of plants 984,143.
5	<i>C. crespilla</i> - - -	Fine Crown Bark - -	4,380	2 10	to 6 -	
6	<i>C. lancifolia</i> - - -	Pitayo Bark - - -	159	1 8	to 2 10	
7	<i>C. nitida</i> - - -	Genuine Grey Bark -	2,786	1 8	to 2 9	
8	<i>C. species</i> without name.	Fine Grey Bark - -	8,500	1 8	to 2 10	
9	<i>C. micrantha</i> - - -	Grey Bark - - -	15,050	1 8	to 2 9	
10	<i>C. Peruviana</i> - - -	Finest Grey Bark -	3,389	1 8	to 2 10	
11	<i>C. Pahudiana</i> - - -	Unknown - - -	425	Unknown.		
TOTAL Number of Plants - - -			984,143			

TABLE II.

MEMORANDUM of the Growth of Eleven Plants of *C. succirubra*, planted on the Second Denison Plantation, at Neddivuttum, on the 30th August 1862.

Number of Plants.	Height in Inches when Planted on the 30th August 1862.	Height in Inches on the 31st December 1865.	Height in Inches on the 31st January 1866.	Growth in Inches during January 1866.	By whom Planted.	REMARKS.
1	23	131	131½	½	His Excellency Sir W. Denison.	TABLE II. exhibits the growth of 11 plants of <i>C. succirubra</i> planted out by his Excellency the Governor, and other gentlemen, at Neddivuttum, on the 30th August 1862. The average growth of these plants during the month is $\frac{2}{11}$ ths of an inch, or $\frac{5}{11}$ ths of an inch under the growth of last month. One of the two plants cut down on the 20th of March 1863 for the bark submitted to Mr. Howard for analysis, has made strong shoots of 82½ inches in height, giving the growth of half an inch during the month.
2	16½	117½	118½	1½		
3	19	119	121	2		
4	15	110½	110½	—		
5	27	134½	135½	1½		
6	20	107½	108	½		
7	20	122	123½	1½		
8	18	124½	124½	—		
9	20	129½	129½	—		
10	20	130½	131	½		
11	18	112½	113½	1		
12	—	82	82½	½	J. W. Brecks, Esq. Dr. Sanderson. J. D. Sim, Esq. Lieutenant McLeod. P. Grant, Esq. Plant cut down for bark.	

TABLE III.

SHOWING the Height of Twelve Plants of *C. officinalis*, planted on the Dodabetta Plantation at Ootacamund, on the 30th September 1863.

Number of Plants.	Height in Inches when Planted on the 30th September 1863.	Height in Inches on the 31st December 1865.	Height in Inches on the 31st January 1866.	Growth in Inches during January 1866.	REMARKS.
1	19	106½	109	2½	The 12 plants of <i>C. officinalis</i> (a shrubby species) on the Dodabetta Plantation, gives an average growth of 2½ inches, of quarter of an inch under that of last month.
2	14½	95	97½	2½	
3	28	107	110	3	
4	22	103½	106½	3	
5	21½	107	110½	3½	
6	28	119½	121½	2	
7	22½	101	103½	2½	
8	21½	100½	103	2½	
9	21½	113	116	3	
10	19½	104½	107½	3	
11	24	109½	112	2½	
12	24	103	111½	3½	

TABLE IV.

REGISTER of Chinchona Plants Distributed.

NAMES.	STATION.	Number of Plants.
Mr. F. N. Maltby - - - -	Travancore - - - -	16
Dr. Junghuhn - - - -	Java - - - -	56
Mr. A. R. Lascelles - - - -	Ootacamund - - - -	12
„ M. Anderson - - - -	Jamaica - - - -	2
Dr. Wiche - - - -	Bombay - - - -	10
„ T. Anderson - - - -	Calcutta - - - -	554
„ Jamieson - - - -	Saharanpore - - - -	107
Professor Lees - - - -	Calcutta - - - -	547
Rajah of Travancore - - - -	Travancore - - - -	521
Major Morgan - - - -	Ootacamund - - - -	1,534
Mr. E. T. Fitzgerald - - - -	Calcutta - - - -	558
„ J. W. B. Money - - - -	ditto - - - -	1,369
„ W. Bourns - - - -	ditto - - - -	532
Captain Cox - - - -	Wynn - - - -	6
Mr. Hollock - - - -	ditto - - - -	2
„ T. Sheffield - - - -	Ootacamund - - - -	12

The number of plants issued to the public during the month is eight, making the total distributed 83,684.

TABLE IV.—Register of Chinchona Plants Distributed—*continued.*

NAMES.	STATION.	Number of Plants.	REMARKS.
Dr. F. Day	Cochin	100	
Mr. Brown	Tellicherry	12	
" J. Hall	Ootacamund	144	
" T. Knop	- ditto	18	
Captain Lees	Bengal	281	
Mr. W. H. Rayne	Manantoddy	424	
Rev. — Sawyer	Ootacamund	1,018	
Mr. Frend	- ditto	512	
" Hollock	- ditto	1	
" J. Pierie	Seegoor	12	
Colonel Scott	Ootacamund	1,236	
Mr. Berend	Cachar	275	
Rev. J. Hunter	Coonoor	12	
Mr. J. Mullaly	- ditto	24	
" W. H. Stanes	- ditto	1,262	
Colonel R. Cooper	Kotagherry	12	
Mr. P. Cookburn	- ditto	12	
Colonel Woodfall	Coonoor	12	
Mr. C. Anderson	- ditto	24	
Colonel Angelo	Ootacamund	12	
Rev. E. Laseron	- ditto	12	
Captain R. N. Taylor	Coorg	96	
Major W. Agnew	Assam	189	
Mr. V. H. Levinge	Madura	12	
Chief Commissioner of	Nagpore	28	
Mr. Fletcher	Ootacamund	24	
Gool Mahomed	- ditto	20	
General McCleverty	New Zealand	23	
Mr. W. Robinson	Kotagherry	330	
" Crake	Wynad	12	
" H. R. Dawson	Seegoor	12	
Captain Mann	Coorg	48	
Mr. E. Roberts	- ditto	530	
" H. Russell	Wynad	52	
Rev. — Wait	Coonoor	2	
Collector of Belgaum	Belgaum	28	
Collector of Honore	Honore	28	
Dr. Ross	- ditto	15	
His Excellency the Governor	Bombay	158	
Mr. H. Hinde	Wynad	12	
" E. B. Thomas	Coonoor	74	
Rajah of Poonganoor	Poonganoor	12	
Major Grant	Wellington	226	
Messrs. Thomson, Shaw & Co.	Poonganoor	28	
Mr. J. H. Trinson	- ditto	31	
Dr. Muller	Melbourne	28	
Mr. Tyrrell	Mysore	12	
Dr. Sayers	Vellore	12	
Major C. P. Taylor	Ootacamund	5,250	
Dr. Wilson	- ditto	6	
Mr. Schnarrie	- ditto	15,000	
Captain Fuller	Coonoor	417	
Dr. Drummond	Ootacamund	224	
Captain Jennings	- ditto	1,756	
Lieut. H. B. Montmorency	Bangalore	6	
Mr. McHutchin	Ootacamund	3	
Colonel Molesworth	- ditto	6	
Mr. C. Gray	Coonoor	12	
" H. B. Leddell	Ootacamund	12	
" Minchin	Wynad	1,600	
His Excellency the Governor	Vizagapatam	35	
Mr. R. F. Phillips	Kotagherry	1,117	
Colonel Cooke	- ditto	24	
Mr. G. J. Glasson	Wynad	1,000	
Dr. Macpherson	Mercara	400	
Mr. W. H. Kerr	Coorg	3,100	
" James	Ootacamund	1,000	
Colonel Whish	Bengal	82	
Mr. K. Mair	Calcutta	1,180	
" W. Shakespear	- ditto	61	
" E. E. Meakin	- ditto	168	
" C. Ackland	- ditto	150	
" K. McIver	- ditto	124	

TABLE IV.—Register of Chinchona Plants Distributed—*continued*.

NAMES.	STATION.	Number of Plants.	REMARKS.
Mr. Havelock - - - -	Ootacamund - - - -	12	
" H. de Facien - - - -	Kartairy - - - -	6,821	
Major Sweet - - - -	- ditto - - - -	910	
Captain Campbell - - - -	Bangalore - - - -	6	
Royal Gardens - - - -	Mauritius - - - -	36	
Hon. W. R. Arbutnot - - - -	Wynad - - - -	98	
Mr. H. Maxwell - - - -	Bombay - - - -	50	
Mrs. C. Smith - - - -	Wynad - - - -	316	
Captain Beckley - - - -	Wellington - - - -	200	
Mr. Walsh - - - -	Salem - - - -	100	
His Excellency the Governor General	Java - - - -	175	
Captain Richardson - - - -	Kulhatty - - - -	509	
Rajah of Poongano - - - -	Poonganoor - - - -	24	
His Excellency the Governor - - - -	Madras - - - -	24	
Mr. J. W. B. Money - - - -	Ootacamund - - - -	25,000	
Captain Mitcheson - - - -	- ditto - - - -	50	
Mr. R. H. Elliot - - - -	Munjerabad - - - -	157	
His Excellency the Governor General	Goa - - - -	262	
Colonel Phayre - - - -	Rangoon - - - -	152	
Mr. Ryall - - - -	Kotagherry - - - -	24	
" J. Gordon - - - -	Coonoor - - - -	1,701	
" J. Rohde - - - -	Neddivuttum - - - -	100	
" J. Higginbotham - - - -	Goodaloor - - - -	12	
" S. Pitol - - - -	Mauritius - - - -	36	
" J. Horne - - - -	- ditto - - - -	36	
M. Edouard Cremary - - - -	Reunion - - - -	51	
For the French Government - - - -	Algiers - - - -	45	
Mr. J. B. Norton - - - -	Shevaroy - - - -	50	
" Mackay - - - -	Punjab - - - -	50	
" W. Forsyth - - - -	Central Provinces - - - -	169	
Colonel Cadell - - - -	Coorg - - - -	62	
Mr. J. L. Browning - - - -	Wynad - - - -	4	
" H. Leeds - - - -	Burmah - - - -	112	
Maloo Sait - - - -	- ditto - - - -	6	
Mr. A. D. Brown - - - -	Dimhatty - - - -	53	
" J. C. Misquith - - - -	Ootacamund - - - -	300	
" J. L. Transsen - - - -	Coonoor - - - -	8	
TOTAL Number of Plants - - - -		83,684	

Ootacamund,
19 February 1866.

(signed) W. G. McIvor,
Superintendent, Government Chinchona Plantations.

— No. 76. —

From Messrs. Thomson, Hankey & Co., to the Under Secretary of State
for India.

7, Mincing Lane, London,
3 February 1866.

Sir,

WE have been requested by the Executive Committee of the Jamaica Government to procure for them the works on Chinchona cultivation, enumerated at foot. We have applied to Kew Gardens on the subject, and also to the department of the Reporter on the Products of India, Whitehall Yard, but without success. It has, however, been suggested to us, that you may be able to inform us where the pamphlets in question may be obtained, as also copies of works and reports on Chinchona cultivation by Mr. Markham, of the India Office, which, although not mentioned, the Government of Jamaica would no doubt be very glad to obtain.

353.

B B 3

If you could assist us in obtaining any of these works, we should esteem it a great favour.

We trust that you will excuse our troubling you in this matter.

To the Under Secretary
of State of India.

We are, &c.
(signed) *Thomson, Hankey & Co.*

EXTRACT of Requisition by Jamaica Government.

Notes on the propagation and cultivation of the Medical Chinchonas. Printed and published by order of the Government of Madras, by William Graham McIvor.

Two letters from W. J. McIvor, Esq., to J. D. Quin, Esq., Secretary to Government, Madras.

Any other information on the subject.

— No. 77. —

From Mr. *Deedes* to *Thomson, Hankey & Co.*

Gentlemen,

India Office, 13 February 1866.

IN reply to your letter of the 3d instant, requesting papers for the use of the Executive Committee of the Jamaica Government on the propagation of the Chinchona tree, I am directed to inform you that, in the absence of any date, it is impracticable to trace the letters to which reference is made in your letter. The most recent papers on the subject have already been communicated to the Governor of Jamaica through Her Majesty's Secretary of State for the Colonies, and no duplicate remains in this office.

I am directed to add, that Mr. Markham is at present in India, engaged on a report on the plantations which have been established in that country; when his report has been received, a copy shall be immediately forwarded to your address. In the meantime two reports on the progress of the undertaking, by Mr. McIvor, are forwarded herewith, being the only papers on the subject of general interest since the publication of the Return ordered by the House of Commons to be printed, 20th March 1863, No. 118.

Enclosures to
Madras, Mis., Re-
venue Letters, Nos.
16 and 68 of 1865
(Annual Reports,
1863-64, 1864-
65.)

Messrs. Thomson, Hankey & Co.,
7, Mincing Lane, E.C.

I am, &c.
(signed) *Henry Deedes.*

— No. 78. —

From Mr. *Clements Markham* to the Under Secretary of State for India.

Sir,

21, Eccleston Square, S.W.,
16 April 1866.

THE Emperor of Mexico, encouraged by my success in the introduction of Chinchona cultivation into India, is anxious to inaugurate a similar experiment in his own dominions, where Humboldt considered that success would be certain. I received an official letter on the subject from Mexico while at Suez, on my way to India last October, to which I sent a detailed reply.

2. In consequence of my report, His Majesty has commissioned Captain Maury, formerly of the Confederate Navy, and now a Mexican Councillor of State, to apply for Chinchona seeds grown in India, and for full instructions as to the cultivation of the plant. I presume that it will be only necessary to make this application known to the Madras Government, to ensure attention to His Majesty's wishes.

3. Mr. McIvor should be instructed to transmit to me direct, parcels of well-developed seeds of *C. succirubra* and *C. officinalis*, as soon as they are available, and Captain Maury will forward them to Mexico at once, where preparations will have been made for their reception. A copy of Mr. McIvor's most recent manual

manual of Chinchona cultivation should also be furnished to Captain Maury, in order that it may be translated into Spanish. It has already been translated into Portuguese, at Goa.

4. It is very gratifying to find that the introduction of Chinchona cultivation into India, while conferring an inestimable blessing on our own possessions, will also benefit those Spanish American States whence the plants originally came. The authorities of those States did every thing in their power to thwart my operations; yet within the last two years I have received applications from owners of forest land in New Granada, Ecuador, and Bolivia, for instructions as to our method of cultivating those trees which have hitherto only existed in a wild state in their native habitat; and now it will be to British India, and not to South America, that Mexico will owe the blessings derivable from the cultivation of the fever-dispelling bark.

See my "Travels in
Peru and India,"
p. 388.

To the Under Secretary
of State for India.

I have, &c.
(signed) *Clements R. Markham.*

Enclosure in No. 78.

From Don *Narciso Lorenzano*, an Exporter of Chinchona Bark, to Mr. *Griffith*, Her Majesty's Consul General at Bogota.

My dear Sir,

Bogota, 4 March 1864.

I HAVE to thank you for having sent me a copy of the "Edinburgh Review" of last year, in which I have had the satisfaction of reading the article on the cultivation of quina trees in the East Indies. Permit me to congratulate you on the successful result of this undertaking, which partly ensures the supply of so precious a drug for the future. It appears to me that the principal motive which induced the Government of India to commence this cultivation, after overcoming so many difficulties, was the fear that the quina trees would be extirpated, in consequence of the disorder and waste that is allowed in the woods, where they are destroyed by the barbarous method of pulling up the roots. Fortunately this destructive method, which without any doubt would extirpate this precious plant in a few years, is only practised in the forests of Pitayo, where it is due to the immoderate desire for making money, which has taken possession of the Indians, who own the greater part of the land. But in none of the other establishments for the collection of bark in New Granada has a similar scandal been repeated. On the contrary, beneficial rules are observed for the conservancy of the woods, more especially in those where I have a proprietary interest. The method consists in leaving a part of the trunk, about three feet in height, whence shoots may sprout, and in clearing away the surrounding trees to enable the rays of the sun to penetrate. By this means most of the trees that are cut down quickly shoot up, and, the rays of the sun penetrating to the cleared ground, the seeds which fall from the trees germinate freely. Thus we have the satisfaction of seeing, in the forests worked on this principle, that the trunks of cut trees send out new shoots, and that the young plants grow vigorously. This result gives us full confidence that the good kinds of quinas which exist in this country will be permanently preserved.

To dissipate the apprehension that a day may arrive when humanity will be deprived of this most useful remedy by the destruction of the forests which contain it, I think it will be sufficient to point out our "Andes," which, from the frontier of Brazil and Bolivia to the snowy summits of Cachin and Cocuy, contain the different species of quinas described by the learned Mutis, Caldas, and Humboldt, in abundance. Some of these species do not now find a place in the European markets, because they cannot fetch a remunerative price, owing to their inferior quality, only containing one to two per cent. of alkaloids, quinine, Chinchonidine, Chinchonine, and quinidine. But I hope that in course of time, when the roads of this country are improved, and when the increased demand for this drug has caused its price to rise, then the inferior drugs may be exported, and the vast forests may be worked with advantage to humanity as well as to the speculators. But in spite of the immense deposits of febrifuge barks which Providence has collected in our Cordilleras, I shall always consider the plantations which the foresight of the English Government has established in the East Indies to be of great use, for they will hereafter supply the wants of those countries in which the use of the drug is rapidly extending, as I learn from the same article in the "Edinburgh Review," where the value of the quinine consumed during 1857 and 1858 is given at 54,500 l.

From the above considerations, we may conclude that there need be no fear that humanity will see itself deprived of this precious medicine, seeing that as well in Bolivia as in Peru, Ecuador, and New Granada, the rule of cutting the bark according to a fixed plan is observed, and care is taken that the woods are replenished with increased numbers of plants of the best species, while some experiments have been made in forming plantations on lands where the best conditions for their growth are found. From all this we hope that in a few years we may see magnificent results.

Hoping that this short account may be of some use, I have the pleasure to repeat that whenever you desire any information respecting the quina trade in this country, I shall be happy to supply it, so far as my limited knowledge will permit. I return you the copy of the "Edinburgh Review," with due thanks, and subscribe myself,

Yours, &c.
(signed) *Narciso Lorenzano.*

— No. 79. —

MEMORANDUM by Mr. *C. R. Markham* on the Preparation of a Monograph on the Chinchona Genus.

THERE is great confusion in the classification of the species of the Chinchona genus, and there is no work of reference on the subject by means of which an inquirer engaged in the cultivation may acquire information which is of great importance to him. The work of Dr. Weddell, though useful so far as the Bolivian species are concerned, is of no value as a guide to any of the other valuable species, and is moreover out of date.

I would venture, therefore, to suggest that the Secretary of State in Council should grant a small sum of money for the preparation of a monograph on the Chinchona genus, in conjunction with the Linnæan Society. It is not unusual to give encouragement of this kind to works connected with India which are solely of a literary or scientific character. A Chinchona monograph would be of great scientific value; and this circumstance recommends my proposal to favourable consideration, and will probably ensure the co-operation of the Linnæan Society. But the chief reason for encouraging and assisting such a publication is, that it will be of the very greatest practical utility to the superintendents of Government plantations, and to private speculators throughout India. There is utter confusion in the classification of many of the species at present. Dr. Anderson, in his last report, quotes high authority for an opinion that two particular species are identical, when in reality they are quite distinct. Similar mistakes of other cultivators have also come to my knowledge. Now, the different species require different treatment under cultivation, so that uncertainty as to their identification will lead to most disastrous results, and an authoritative settlement of all questions connected with them is, therefore, loudly called for. A Chinchona monograph would, it is submitted, under these circumstances, be a work which might properly be assisted by the Secretary of State in Council.

I have consulted Dr. Hooker on the subject, who is of opinion that such a work would be in every way most important, and he has made the following suggestions. The work, he thinks, might be cheaply published in combination with the Linnæan Society. The India Office might pay for the plates (12 to 15 in number), which could be done by Mr. Fitch on stone, in quarto, for 2*l.* apiece, and would take 50 or 100 copies for distribution in India. The Society would do the printing, and publish and distribute the work as a separate part of their transactions, complete *per se*. Dr. Hooker thinks that the expense to the India Office would be covered by a grant of 200*l.*, and that the work might be finished by Christmas. He proposes that Dr. Thomson (late Superintendent of the Botanical Gardens at Calcutta, and joint author, with Dr. Hooker, of the "Flora Indica") should be employed to prepare the work; and that he should be restricted as to time of producing it. If this proposal should be approved, I would open communications on the subject with Dr. Hooker, Dr. Thomson, and Mr. Bentham, the President of the Linnæan Society.

(signed) *Clements R. Markham.*

25 April 1865.

— No. 80. —

From the Superintendent, Government Botanical Gardens, and Chinchona Plantations, to the Acting Secretary to Government Revenue Department, Madras.

16 November 1865.

1. I HAVE the honour to forward the budget estimates of this department for the official year 1866-67, which I trust will receive the approval of Government. This estimate provides for 150 acres additional land being brought into cultivation; yet, notwithstanding the estimated expenditure of 1866-67 is upwards of 14,000 rupees less than 1865-66. This decrease is principally owing to the early planted portions of the plantations being now so well established as to require little labour in maintaining them.

2. The term of engagement of the deputy superintendent, Mr. Batcock, expires on the 14th of October 1866, and I have entered in the budget estimate an increase to his salary of Rs. 41. 10. 8., which will make his total pay 200 rupees per mensem, from the 14th October 1866, to the 30th April 1867, and trust that this arrangement will meet with the approval of Government.

3. With the sanction of Government, I would also most respectfully propose to place the Neddivuttum and Pycara Plantations under one assistant superintendent, on a salary of 150 rupees per mensem, or an increase of 25 rupees. This will effect a saving in the establishment, while one superintendent will be able to perform the whole work, now that a road is open connecting the two plantations.

4. In consequence of the high rates of provisions on the hills, I have also proposed, for the sanction of Government, an increase of 10 rupees per mensem to the salaries of the office manager and pay clerk.

ORDER of the Madras Government, 5 January 1866.

1. With his letter above recorded, the superintendent of the Government Chinchona Plantations submits his budget of receipts and charges for 1866-67.

2. Mr. McIvor's estimate of receipts amounts to 19,300 rupees, against 11,200 rupees, the actual collections of 1864-65, and 20,000 rupees, the budget estimate for 1865-66. The price of Chinchona plants having been lately reduced, the estimate will be fixed in round numbers at 20,000 rupees. Mr. McIvor's return, it is observed, has not been correctly framed. The accountant-general will furnish him with the necessary instructions.

3. The budget of charges amounts to 84,778 rupees, and is less than the estimate (90,467 rupees) for 1865-66 by 14,689 rupees, notwithstanding (as Mr. McIvor states) the provision made for the addition of 150 acres to the ground already under cultivation. Mr. McIvor attributes this decrease principally "to the early planted portions of the plantations being now so well established as to require little labour in maintaining them;" but the decrease, the Government observe, is chiefly on account of buildings, and in the working charges" there is an increase of 1,400 rupees. The estimate provides for planting 150 acres during 1866-67. Mr. McIvor will report the area which he proposes to plant in each estate during the year.

	Decrease.
	Rs.
Construction and repair of buildings	10,500
Orchid and Fern House	2,600
Fountain	1,500
Tea Plantations	1,844
Rs.	16,444

4. Mr. McIvor proposes increases of salary to the persons named in the margin. Such propositions must be submitted separately and distinctly from the budget, with all necessary particulars. The excess of 720 rupees will therefore be struck out and Mr. McIvor will be instructed to submit these proposals separately; there will be no difficulty in providing the small sum requisite from savings.

	Increase.
	R. a. p.
Mr. Batcock	41 10 8
Assistant Superintendent of Neddivuttum and Pycara Plantations	25 - -
Office Manager	10 - -
Pay Clerk	10 - -

5. The sum of 7,500 rupees entered for construction and repair of buildings is passed. Mr. McIvor will submit plans and estimates for any new buildings and additions, to present buildings which may be required. "Peons, gardeners,

and servants' clothing," is a new item, but considering the nature of the climate of the hills and the usage in other departments, it is passed.

The sums authorised for 1865-66, and those now passed for 1866-67, are given below:—

	1865-66.	1866-67.
	<i>Rs.</i>	<i>Rs.</i>
CHINCHONA PLANTATIONS:		
Salaries - - - - -	12,400	10,900
Establishments - - - - -	34,500	34,450
Contingencies - - - - -	3,500	4,000
Working Charges - - - - -	21,600	23,000
Buildings - - - - -	18,000	7,500
Travelling Allowance to Superintendent -	1,100	1,100
Clothing - - - - -	-	550
TOTAL - - - - -	91,100	81,500
BOTANICAL AND HORTICULTURAL GARDENS:		
Annual Allowance - - - - -	1,200	1,200
Erection of Orchid and Fern Houses - -	4,100	-
TOTAL - - - - -	5,300	1,200
Tea Plantation - - - - -	3,200	1,400
GRAND TOTAL - - - - -	99,600	84,100

7. With these remarks the budget will be transmitted to the Accountant-General.

— No. 81. —

From the Government of Madras to the Secretary of State for India.

Madras, 13 April 1866.

WE have the honour to forward, for your information, the accompanying Tabular Report on the number, condition, &c., of the Chinchona plants on the Neilgherries, on the 28th of February 1866.

Enclosure in No. 81.

REPORT on the Number, Distribution, and Condition of Chinchona Plants on the Neilgherries, on the 28th February 1866.

No. of Species.	Botanical Names.	Commercial Names.	Number of Plants.	Value per Lb. of Dry Bark in the London Market.		REMARKS.
				s. d.	s. d.	
1	<i>C. succirubra</i> - -	Red Bark - -	290,655	2 6	to 8 9	<p>The number of plants planted out in the plantations remain the same as in last month, namely, 244,871.</p> <p>The increase by propagation is 42,903, being 9,652 under the average of the last six months, making the total number of plants 1,026,796.</p>
2	<i>C. Calisaya</i> , var. <i>Frutex</i> , var. <i>Vera</i> .	Yellow Bark - -	18,151	2 10	to 7 -	
3	<i>C. officinalis</i> , var. <i>Condaminea</i> (<i>C. Uritusinga</i>).	Original Loxa Bark	8,219	2 10	to 7 -	
4	<i>C. officinalis</i> , var. <i>Bonplandiana</i> (<i>C. Chahuarguera</i>).	Select Crown Bark -	675,023	2 10	to 7 -	
5	<i>C. crespilla</i> - -	Fine Crown Bark -	4,380	2 10	to 6 -	
6	<i>C. lancifolia</i> - -	Pitayo Bark - -	198	1 8	to 2 10	
7	<i>C. nitida</i> - -	Genuine Grey Bark	2,786	1 8	to 2 9	
8	<i>C. species</i> without name.	Fine Grey Bark -	8,500	1 8	to 2 10	
9	<i>C. micrantha</i> - -	Grey Bark - -	15,065	1 8	to 2 9	
10	<i>C. Peruviana</i> - -	Finest Grey Bark -	3,389	1 8	to 2 10	
11	<i>C. Pahudiana</i> - -	Unknown - -	425	Unknown.		
TOTAL Number of Plants - - -			1,026,796			

TABLE II.

MEMORANDUM of the Growth of Eleven Plants of *C. succirubra*, planted on the Second Denison Plantation, at Neddivuttum, on 30 August 1862.

Number of Plants.	Height in Inches when Planted on 30 August 1862.	Height in Inches on 31 January 1866.	Height in Inches on 28 February 1866.	Growth in Inches during February 1866.	By whom Planted.
1	23	181½	182½	0½	His Excellency Sir W. Denison.
2	16½	118½	119½	1	
3	19	121	122½	1½	
4	15	110½	111½	0½	
5	27	185½	186½	1	
6	20	108	109	1	
7	20	123½	124½	1	J. W. Breeks, Esq.
8	18	124½	125½	0½	Dr. Sanderson.
9	20	129½	130½	1	J. D. Sim, Esq.
10	20	131	131½	0½	Lieutenant McLeod.
11	18	118½	114½	1	P. Grant, Esq.
12	-	82½	83	0½	Plant cut down for bark.

TABLE II. exhibits the growth of 11 plants of *C. succirubra*, planted out by his Excellency the Governor, and other gentlemen, at Neddivuttum on the 30th August 1862. The average growth of these plants during the month, is $\frac{19}{11}$ of an inch, or $\frac{1}{11}$ of an inch above the growth of last month.

One of the two plants cut down on the 20th of March 1863, for the bark submitted to Mr. Howard for analysis, has made strong shoots of 83 inches in height, giving the growth of $\frac{1}{2}$ an inch during the month.

TABLE III.

SHOWING the Height of Twelve Plants of *C. officinalis*, planted on the Dodabetta Plantation at Ootacamund, on the 30th September 1863.

Number of Plants.	Height in Inches when Planted on 30 September 1863.	Height in Inches on 31 January 1866.	Height in Inches on 28 February 1866.	Growth in Inches during February 1866.	REMARKS.
1	19	109	110½	1½	The twelve plants of <i>C. officinalis</i> (a shrubby species) on the Dodabetta Plantation gives an average growth of 2½ inches, or ½ of an inch, under that of last month.
2	14½	97½	98	0½	
3	28	110	111½	1½	
4	22	106½	108	1½	
5	21½	110½	113½	3	
6	28	121½	124	2½	
7	22½	103½	106	2½	
8	21½	103	106½	3	
9	21½	116	118½	2½	
10	19½	107½	109½	2	
11	24	112	114½	2½	
12	24	111½	113½	2	

TABLE IV.

REGISTER of Chinchona Plants Distributed.

NAMES.	STATION.	Number of Plants.
Mr. F. N. Maltby -	Travancore -	16
Dr. Junghuhn -	Java -	56
Mr. A. R. Lascelles -	Ootacamund -	12
Mr. M. Anderson -	Jamsica -	2
Dr. Wiche -	Bombay -	10
Dr. T. Anderson -	Calcutta -	554
Dr. Jamieson -	Saharanpore -	107
Professor Lees -	Calcutta -	547
Rajah of Travancore -	Travancore -	521
Major Morgan -	Ootacamund -	1,534
Mr. E. T. Fitzgerald -	Calcutta -	558
Mr. J. W. B. Money -	- ditto -	1,369
Mr. W. Bourne -	- ditto -	532
Captain Cox -	Wynad -	6
Mr. Hollock -	- ditto -	2
Mr. T. Sheffield -	Ootacamund -	12
Dr. F. Day -	Cochin -	100
Mr. Brown -	Tellicherry -	12
Mr. J. Hall -	Ootacamund -	144
Mr. T. Knop -	- ditto -	18
Captain Lees -	Bengal -	281
Mr. W. H. Rayne -	Manantoddy -	424
Reverend — Sawyer -	Ootacamund -	1,018
Mr. Frend -	- ditto -	512
Mr. Hollock -	- ditto -	1
Mr. J. Pierie -	Seegoor -	12
Colonel Scott -	Ootacamund -	1,236
Mr. Berend -	Cachar -	275
Rev. J. Hunter -	Coonoor -	12
Mr. J. Mullaly -	- ditto -	24
Mr. W. H. Stanes -	- ditto -	1,262
Colonel R. Cooper -	Kotagherry -	12
Mr. F. Cockburn -	- ditto -	12
Colonel Woodfall -	Coonoor -	12

The number of plants issued to the public during the month is 250, making the total distributed 83,934.

TABLE IV.—REGISTER of Chinchona Plants Distributed—*continued.*

NAMES.	STATION.	Number of Plants.	REMARKS.
Mr. C. Anderson	Coonoor	24	
Colonel Angelo	Ootacamund	12	
Rev. E. Laseron	ditto	12	
Captain R. N. Taylor	Coorg	96	
Major W. Agnew	Assam	139	
Mr. V. H. Levinge	Madura	12	
Chief Commissioner of	Nagpore	28	
Mr. Fletcher	Ootacamund	24	
Gool Mahomed	ditto	20	
General McCleverty	New Zealand	23	
Mr. W. Robinson	Kotagherry	330	
Mr. Crake	Wynad	12	
Mr. H. R. Dawson	Seegoor	12	
Captain Mann	Coorg	48	
Mr. E. Roberts	ditto	530	
Mr. H. Russell	Wynad	62	
Rev. — Wait	Coonoor	2	
Collector of Belgium	Belgaum	28	
Collector of Honore	Honore	28	
Dr. Ross	ditto	15	
His Excellency the Governor	Bombay	158	
Mr. H. Hinde	Wynad	12	
Mr. E. B. Thomas	Coonoor	74	
Rajah of Poonganoor	Poonganoor	12	
Major Grant	Wellington	228	
Messrs. Thomson, Shaw & Co.	Poonganoor	28	
Mr. J. H. Trinson	ditto	31	
Dr. Muller	Melbourne	28	
Mr. Tyrrell	Mysore	12	
Dr. Sayers	Vellore	12	
Major C. P. Taylor	Ootacamund	5,250	
Dr. Wilson	ditto	6	
Mr. Schnarrie	ditto	15,000	
Captain Fuller	Coonoor	417	
Dr. Drummond	Ootacamund	224	
Captain Jennings	ditto	1,750	
Lieut. H. B. Montmorency	Bangalore	6	
Mr. McHutchin	Ootacamund	3	
Colonel Molesworth	ditto	6	
Mr. C. Gray	Coonoor	12	
Mr. H. B. Leddell	Ootacamund	12	
Mr. Minchin	Wynad	1,600	
His Excellency the Governor	Vizagapatam	35	
Mr. R. F. Phillips	Kotagherry*	1,117	
Colonel Cooke	ditto	24	
Mr. G. J. Glasson	Wynad	1,000	
Dr. Macpherson	Mercara	400	
Mr. W. H. Kerr	Coorg	3,100	
Mr. James	Ootacamund	1,000	
Colonel Whish	Bengal	82	
Mr. K. Mair	Calcutta	1,180	
Mr. W. Shakespear	ditto	61	
Mr. E. E. Meakin	ditto	168	
Mr. C. Ackland	ditto	150	
Mr. K. McIver	ditto	124	
Mr. Havelock	Ootacamund	12	
Mr. H. de Facien	Kartairy	6,821	
Major Sweet	ditto	910	
Captain Campbell	Bangalore	6	
Royal Gardens	Mauritius	36	
Hon. W. R. Arbuthnot	Wynad	93	
Mr. H. Maxwell	Bombay	50	
Mrs. C. Smith	Wynad	316	
Captain Beckley	Wellington	200	
Mr. Walsh	Salern	100	
His Excellency the Governor General	Java	175	
Captain Richardson	Kulbutty	509	

TABLE IV.—REGISTER of Chinchona Plants Distributed—*continued.*

NAMES.	STATION.	Number of Plants.	REMARKS.
Rajah of Poonganoor - - -	Poonganoor - - -	24	
His Excellency the Governor - - -	Madras - - -	24	
Mr. J. W. B. Money - - -	Ootacamund - - -	25,000	
Captain Mitcheson - - -	- ditto - - -	50	
Mr. R. H. Elliot - - -	Munjerabad - - -	157	
His Excellency the Governor General	Goa - - -	252	
Colonel Playre - - -	Rangoon - - -	152	
Mr. Ryall - - -	Kotagherry - - -	24	
Mr. J. Gordon - - -	Coonoor - - -	1,701	
Mr. J. Rohde - - -	Neldivuttam - - -	100	
Mr. J. Higginbotham - - -	Goodaloor - - -	12	
Mr. S. Pitol - - -	Mauritius - - -	36	
Mr. J. Horne - - -	- ditto - - -	36	
M. Edouard Cremery - - -	Reunion - - -	51	
For the French Government - - -	Algiers - - -	45	
Mr. J. B. Norton - - -	Shevaroy's - - -	50	
Mr. Mackay - - -	Punjab - - -	50	
Mr. W. Forsyth - - -	Central Provinces - - -	169	
Colonel Cadell - - -	Coorg - - -	62	
Mr. J. L. Browning - - -	Wynad - - -	4	
Mr. H. Leeds - - -	Burma - - -	112	
Maloo Sait - - -	- ditto - - -	6	
Mr. A. D. Brown - - -	Dimhutty - - -	53	
Mr. J. C. Misquith - - -	Ootacamund - - -	300	
Mr. J. L. Transsen - - -	Coonoor - - -	8	
Captain Fitzgerald - - -	Calcutta - - -	150	
Mr. J. Mullaly - - -	Coonoor - - -	100	
TOTAL Number of Plants - - -		83,934	

Ootacamund,
March 1865,

(signed) W. G. McIvor,
Superintendent, Government Chinchona Plantations.

— No. 82. —

From the Government of Madras to the Secretary of State for India.

Madras, 11 April 1866.

1. IN continuation of our Despatch, 25th December 1865, we have the honour to forward the accompanying further papers relative to Mr. McIvor's application for a patent for his discovery of the utility of moss in increasing the deposition of quinine in the bark of the Chinchona.

2. You will observe that we have recommended to the Government of India that the grant of the patent should be withheld, for the reasons mentioned in the Minutes recorded in our Proceedings of 14th March.

Enclosures in No. 82.

From the Officiating Under Secretary to the Government of India, Home Department, to the Secretary to the Government of Fort Saint George.

Fort William, 25 January 1866.

WITH reference to your letter, No. 3,084, dated 21st ultimo, drawing the attention of the Governor General in Council to the fact that Mr. McIvor "has applied for a patent for his discovery of the utility of moss in increasing the deposition of Quinine in the bark of Chinchona," I am directed to inquire whether it is to be understood from your communication that the Madras Government considers it objectionable on the part of Mr. McIvor, as a servant of Government, to have applied for the patent in question; or, whether it is intended to indicate a doubt as regards Mr. McIvor's, or any person's right to obtain an exclusive privilege in respect of such a matter; or, lastly, granting the legal right to obtain an exclusive privilege, whether the Madras Government consider it should be, in this case, disallowed, as being generally prejudicial to the public.—(See Section 16 of Act XV. of 1859.)

MINUTE by the Honourable T. Pycroft.

1. In the above letter the Government of India, in reply to our letter of 21st December last, drawing attention to an application made to them by Mr. McIvor, Superintendent Government Chinchona Plantations on the Neilgherry Hills, for a patent for his discovery of the utility of moss in increasing the deposition of Quinine in the bark of Chinchona, inquire—

First. Whether it is considered objectionable on the part of Mr. McIvor, as a servant of Government, to have applied for the patent in question?

Secondly. Whether it is considered doubtful as regards Mr. McIvor, or any person, that he should have a right to obtain an exclusive privilege in respect of such a matter? and,

Thirdly. Granting a legal right to obtain an exclusive privilege, whether the Madras Government consider that it should be in this case disallowed, as being generally prejudicial to the public?—Act XV. 1859, Section 16.

2. It seems to me that all these three questions should be answered in the affirmative.

3. As to the first, Mr. McIvor is the Superintendent of the Government Chinchona Plantations on the Neilgherries, on the liberal salary of 500 rupees per mensem. As such he has not had to carry out the cultivation of a particular plant according to a system already established. He has had to undertake the cultivation of the Chinchona from its first introduction from South America, and to ascertain, by varied and repeated trials, the soil, climate, temperature and exposure best suited to the plant, and the processes by which its alkaloids may most be developed. His proceedings have throughout been essentially tentative and experimental; and it seems to me out of all reason that he should be allowed to avail himself of his position, and the means placed by Government at his disposal for the conduct of his experiments, in land, Chinchona plants, establishment, and money to make discoveries, to be turned against the Government which employs him and affords him these facilities, and to be enjoyed by them only on such terms as he may think proper to demand.

4. If this be permitted in respect to this particular alleged invention of the mossing of the Chinchona plant, where is it to end as regards Mr. McIvor himself and others?

5. Mr. McIvor may patent every process connected with the cultivation of the Chinchona plant which he may discover, from the potting of the seedling until it becomes a forest tree, or connected with the extraction and development, &c., of its alkaloids.

6. What he does, others in like circumstances may do. Mr. Markham has lately recommended that a Quinologist of established reputation may be procured by this Government from England, for the purpose of investigating on the spot the cheapest and most effectual method of extracting the febrifuge alkaloids from the Chinchona bark. The suggestion seems to me a good one, but if Mr. McIvor's case is to form a precedent, the gentleman who may be sent out, unless he be restrained by express stipulations in his covenant, may make every process that he may invent by the use of the bark and chemical apparatus furnished him by Government, the subject of a special patent for his own advantage.

7. This Government have recently sent some Chinchona bark obtained from England to the Government Chemical Examiner, Dr. Wyndowe, and have instructed him, not as his special and peculiar province, but as an adjunct to his ordinary duty, to analyze it and some fresh bark procured from Ootacamund, and report the results. If in the course of his experiments Dr. Wyndowe should hit upon any superior and apparently novel method of extracting quinine or its kindred alkaloids, is he to be at liberty to patent it under Act XX., 1859?

8. Major Morgan, Deputy Conservator of Forests, I observe from the Gazette of India, 6th January 1866, has obtained a patent for a peat cup for the transplantation of the Chinchona plant. Major Morgan's position differs from that of Mr. McIvor, inasmuch as the former, although in the Forest Department, has no special connection with Chinchona cultivation, and made the invention, if it be one, in his own private plantation. This Government, however, was not aware of the patent having been given or applied for until they saw the notice of the filing of the specification in the Gazette, and consequently could not object to it.

9. In the reply to an inquiry whether a cotton press, designed by Dr. Forbes of Bombay, had been patented, this Government were informed (letter from officer in charge of the office of Cotton Commissioner, Dharwar, 29th January 1866) that it had not, as it "had been designed by Dr. Forbes when employed in an official capacity."

10. The second query asked by the Government of India, viz., as to Mr. McIvor's or any other person's right to obtain an exclusive privilege in respect of such a matter as mossing the bark of Chinchona trees, involves perhaps rather a question of law than one for the opinion of this Government. I may, however, remark that large as are the definitions of the terms "invention" and "manufacture" in the interpretation Clause (39) of Act XV, (1859), it seems to me doubtful whether they can apply to so simple a process as wrapping moss or any other natural non-conducting substance round the stem of a tree.

11. Again the process was communicated by Mr. McIvor to Government in view to its being made public use of, or with the knowledge that it would be made of public use, before Mr. McIvor submitted any petition to the Government of India under Act XV, (1859, Section 1), for leave to file his specification.

12. In Mr. McIvor's letter to Government, 3rd May 1865, I find reference made, as per margin, to the application of damp moss to Chinchona stems, from which strips of the bark had been removed. The letter was accompanied by specimens of bark, some of which had, and some had not, been thickened by the application of moss.

13. This letter was sent with the bark to the Secretary of State.

14. In his annual report, dated 16th August 1865, on the Government Chinchona plantations for 1864-65, McIvor (paragraphs 29 and 30) described the method which he had adopted for mossaing the stems of Chinchona plants, from which strips of bark had been removed, and gave an illustration of the method of removing the bark and applying the moss. He stated (paragraph 30) that the application of moss had also the advantage of greatly increasing the weight and thickness of the bark, and, as the observations which had been made seem to indicate, of increasing the alkaloids.

15. Mr. McIvor's annual reports, or such parts of them as relate to changes in the management of the plant, are all printed uniformly as manuals for planters. In the present instance, Mr. McIvor in his letter (18th August 1865) forwarding his annual report, requested that he might be supplied with 300 copies of paragraphs 2 to 13 and 19 to 35 inclusive (which included those, 29, 30, relative to the mossaing) for distribution to planters.

16. In a subsequent letter, 25th September 1865, Mr. McIvor requested that those two paragraphs (29, 30) of his report might be withdrawn, "as the views set out in them now appeared immature, and to require further consideration and more experience, prior to their being laid before the public." I shall show immediately that some days before this last letter was written, Mr. McIvor had applied to the Supreme Government for his patent.

17. Mr. McIvor's report, including these two paragraphs, 29 and 30, and this subsequent letter, was laid on the editor's table on the 1st November 1865.

18. Nothing further was heard from Mr. McIvor on the subject, until, on the 24th November 1865, he reported that the experiment of mossaing trees had proved successful, and that "in order to procure to himself participation in the benefit of results so important, he had considered it desirable to secure the discovery by patent rights under Act XV, 1859."

Telegram from
Home Secretary to
Government of
India, 28 February
1866.

19. I find, on reference to the Government of India, that Mr. McIvor's application to them for the patent was made on the 16th September 1865, more than two months before the above intimation, and nine days before he wrote his letter (25th September) to this Government, in which he requested that that part of his annual report which related to the mossaing of Chinchona trees might be withdrawn, "as his views appeared immature, and requiring further consideration and more experience, prior to their being laid before the public!"

20. It seems to me very questionable whether a process carried on in Government gardens, at Government expense, and by their own servant, described by him in ordinary course in his occasional and yearly reports of operations, which reports were meant to be laid, and which were laid by Government before the public, can form a proper subject of patent rights as against either Government or the public.

21. As respects the third inquiry made by the Government of India, or whether the exclusive privilege sought by Mr. McIvor should be disallowed under Section 16, Act XV, 1859, as being generally prejudicial to the public, I would remark that if Mr. McIvor obtains the patent he can of course charge for the use of it in any royalty that he may see fit to demand. Supposing that, as has been proposed, 1,200 acres of Chinchona plantation be laid out by Government, and that they contain on the average 400 trees to the acre, or 480,000 trees, this at only one anna a tree, would involve a payment from Government to Mr. McIvor of 30,000 rupees per annum for the next 14 years. As, however, Mr. McIvor estimates the present net value of an acre of Chinchona at 700 rupees yearly, and reckons that mossaing the bark will increase the yield thirty-fold, it is not to be supposed that he will limit himself to so small a charge as one anna per tree, and even if he does, we can have no security that his heirs, executors, and assigns will imitate his moderation.

22. The Secretary of State has, in a recent despatch, stated that his object in introducing Chinchona cultivation into India was to reduce the price of its bark as much as possible, and to bring its extracts within the means of the poorest of the population. This benevolent object will hardly be effected, if the officer in charge of the Government plantations is to patent for his own behoof all the important processes that he may devise for the rearing of the plant and development of its alkaloids.

23. My own view, I confess, is, that the Chinchona experiments have now reached that stage, in which Government may, with propriety, withdraw gradually from the undertaking, and leave it to be followed out by private enterprise. Under any circumstances, however, the private cultivator, and the public for whom both he and the Government are working, will have good reason to complain if the production of the alkaloids be made more costly on account of patent rights conferred on Government servants in special charge of their Chinchona plantations.

24. By section 2, Act XV., 1859, the Governor General in Council may make an order to authorise the filing of a specification of an invention, but he is not obliged to grant such authority. It seems to me that in the present instance such authority should not be given, looking to Mr. McIvor's official position, to the nature of the so-called invention, and to the injury to the public, which might result from its being patented. At any rate, seeing the importance attached by the Home Government to the plentiful and cheap supply of quinine for

for use in India, I think that before any patent be granted to Mr. McIvor, the question should be referred for the orders of the Secretary of State.

25. In what I have written above it is not my intention in any way to detract from Mr. McIvor's merits in connection with the Government Chinchona Gardens. Whether or not the rearing of the Chinchona plant on the Neilgherries was a matter of so much difficulty as some have supposed, and whether or not others might not have had as much success as Mr. McIvor, there can be no doubt that he has done his work zealously and well. If the remuneration which he has hitherto received be incommensurate with his services—not that it seems to me so to be—let it be enhanced by means of a special donation, increased salary, or pension on retirement, but let not the cultivation of Chinchona generally be hampered and impeded by the conferring on him of patent rights.

3rd March 1866.

(signed) *T. Pycroft.*

MINUTE by the Honourable *H. D. Phillips.*

1. It is a difficult question rather, whether Mr. McIvor, adverting to the position he has held in the Government Chinchona Plantation, can legally turn to his own special and sole advantage, an improvement, termed by him a discovery, which he is acknowledged to have made with material belonging to his employers, whilst receiving their daily wage. But it is purely a law question, which, at the present time, this Government need not be at the pains of endeavouring to determine.

2. I would, however, meanwhile suggest to the Supreme Government, that they withhold the patent applied for by Mr. McIvor, and applied for, as it seems to me, in a manner which, on reference to the dates and tenor of his letters to this Government, must be regarded as somewhat disingenuous.

3. The reasons which I would adduce for refusing to issue the patent, are clearly and forcibly stated in Mr. Pycroft's Minute. But apart from these, I am quite of opinion with his Excellency the President, that Act XV. of 1859 cannot properly be used for covering and protecting the improvement claimed by Mr. McIvor as his discovery, and if the Act left the grant of a patent to the discretion of this Government, I should not hesitate in refusing to give Mr. McIvor what he wants.

4. Should the pension to which, as an uncovenanted servant, Mr. McIvor will hereafter be entitled, seem to the Secretary of State an insufficient recognition of Mr. McIvor's services, it will be a proper and graceful acknowledgment of his labours to make to him some special donation. But it ought, I think, to be previously determined beyond all doubt, that under the moss-covering system of cultivation, future and successive supplies of bark from the Neilgherry trees will not fail to yield an uninterrupted supply of that unusually large quantity of alkaloids which has been secured by the analysis of the single supply sent to England.

5th March 1866.

(signed) *H. D. Phillips.*

MINUTE by the Honourable the President.

1. I do not think that the so-called "discovery" can be the subject of a patent, first, because such a process has been constantly used by gardeners, though not for the special purpose contemplated by Mr. McIvor; and second, because the process was made public with special reference to this purpose by the Government. I do not think that the fact of Mr. McIvor having obtained the remuneration necessary to enable him to claim a patent right while in the service of Government can disentitle him to the advantage. Nearly every patent for mechanical applications and improvements is taken out by men who have been employed in working machinery for others, and who have procured the knowledge necessary to the invention at the expense of, or rather while working for the benefit of others.

2. I think the Government of India would act wisely in refusing to patent this so-called discovery, but they would also best act justly and fairly to Mr. McIvor were they to make him an acknowledgment should the discovery prove to be valuable, proportionate to the benefit derived from the process, for I hold that the Government, in employing Mr. McIvor, only looked to his experience as a cultivator, and did not have him as an experimentalist generally upon the production of alkaloids.

8 March 1866.

(signed) *W. T. Denison.*

From the Secretary to the Madras Government to the Secretary to the Government of India.

Sir,

Fort St. George, 14 March 1866.

I AM directed to acknowledge your Under Secretary's letter, of 25th January 1866, and to recommend that the grant of the patent applied for by Mr. McIvor should be withheld for the reasons mentioned in the enclosed minutes of the members of this Government.

I have, &c.
(signed) *J. D. Sim,*
Secretary to Government.

—No. 83.—

From the Secretary of State for India to the Government of Madras.

India Office, 16th June 1866.

I HAVE considered, in Council, the letters in the Revenue Department, dated 25th December 1865, and 11th April 1866, forwarding correspondence relative to the invention by Mr. McIvor of a new mode of promoting the deposition of quinine and the other more valuable alkaloids in the bark of the chinchona, by the application of moss to the tree, and to the question of complying with the request submitted to the Government of India by Mr. McIvor, for a patent for his discovery.

2. It has always been laid down that the Government is entitled to the entire results of the labours of its officers in India, obtained in the discharge of their official duties; and, on this principle, the application of Mr. McIvor for a patent for his invention would be inadmissible.

3. The other reasons stated in the minute of Mr. Pycroft, and concurred in by the late Governor and by Mr. Phillips, are, in my opinion, equally conclusive against the grant of the exclusive privileges applied for by Mr. McIvor; and, as the operation of a patent in this case would tend most materially to restrict the benefits which the introduction of the chinchona into India are intended to produce, I entirely approve your recommendation to the Government of India, that the application of Mr. McIvor should not be complied with.

—No. 84.—

From the Government of Madras to the Secretary of State for India.

Madras, 13 March 1866.

1. We have the honour, with reference to your Despatch dated 30th September last (Public, No. 27), to inform you that we have called on the Principal Inspector General of the Medical Department to submit a list of the medical officers whom, having regard to the qualifications you name, he would recommend us to appoint to the proposed Commission, and also to make such suggestions, as occur to him, for ensuring a decisive trial of the relative and positive qualities, as febrifuges, of the various chinchona alkaloids and preparations which, it is hoped, may prove nearly, if not quite, as efficacious as quinine.

2. We have not yet received the promised supplies of these alkaloids, and would be glad to know when they are likely to reach us. You will observe by our Proceedings of the 20th and 24th ultimo, that we have instructed our chemical examiner, Dr. Wyndowe, to analyse some specimens of bark procured from England by our president, as well as specimens furnished by Mr. McIvor.

3. We have the honour also to forward, with our minutes, two reports from Mr. Clements Markham, detailing the results of his inspection of the different chinchona plantations on the Neilgherries, and his visit to the Wynaad Talook, the Pulneys, &c., and setting forth the various measures which he considers it desirable for us to adopt.

Proceedings of Government, 20 Feb. 1866, Nos. 388, 389.
Ditto - - - 24 Feb. " " 488, 486.
Ditto - - - 12 Mar., " " 175-184.

4. You will, we feel sure, be gratified to find how fully Mr. Markham bears out the very favourable reports we have periodically sent you of the progress of our plantations, and of the zealous and able exertions of our superintendent, Mr. McIvor.

5. We shall now notice and state our views on Mr. Markham's suggestions:—

I. The appointment of a quinologist of established reputation, to be stationed at Optacamund for three years, and, in concert with Mr. McIvor, to investigate on the spot the various questions connected with the elaboration of alkaloids, the harvesting of the bark, the most economical and efficacious mode of preparing the febrifuge, &c. &c. Mr. Markham's arguments have convinced us that the appointment of such an officer is very desirable, in the interests alike of the Government and the people, and we beg, therefore, to support Mr. Markham's recommendation. You will observe from Dr. Cleghorn's memorandum (which forms one of the enclosures of Mr. Markham's first report), that the services of the person employed

employed on this duty may also be turned to profitable account in utilizing the medicinal plants of India generally, and we recommend that such work should be declared part of his duty, in subordination, of course, to the primary object of his appointment. We must leave the selection of a suitable person to you, as we are not aware of anyone in India who has made quinology a special subject of study, or whose conclusions would carry weight in Europe.

II. The restriction of the Mailkoondah plantation to 200 acres, to be employed solely as a means of propagating and diffusing the chinchona in that neighbourhood. In our Despatch dated 25th December 1865, No. 75, we mentioned that in consequence of the receipt of your despatch of the 30th September preceding (No. 27, Public), we had postponed the consideration of the extent to which our planting operations should be carried. On referring to our minutes, which accompanied that Despatch, you will observe that our president proposed that our actual cultivation should be limited to 1,200 acres, distributed over our four plantations, that a further aggregate area of 1,000 acres should be reserved for future possible requirements, and that the land occupied in excess of this extent of 2,200 acres should be sold.

	Cultivation.	Reserve.	Total.	To be Sold.
	Acres.	Acres.	Acres.	Acres.
1. Naddiwuttum	600	1100	600	—
2. Pykara	250	300	550	—
3. Dodabet	250	300	550	450
4. Mailkoondah	200	300	500	2,000
	1,200	1,000	2,200	—

We recommend that the extent proposed be cultivated at the three first plantations, and we consider it also very desirable that the proposed reserves at each should be maintained, as they will add considerably to the value of the plantations if these are at any time sold, and will be useful, meanwhile, in many ways. As to the retention of the Mailkoondah plantation, either on its present footing or as proposed by Mr. Markham, we solicit your instructions. The decision of the question must, we apprehend, depend entirely on your views as to the extent to which we should carry our operations generally. If it be your wish that we should make it our aim to provide a sufficiency of quinine for the public establishments throughout India, and of some cheaper, though still efficacious, preparation for the poorer classes, trusting to private enterprize for the production of all that may be required for other demands in India and elsewhere, it would scarcely be prudent, at present, to give up this plantation, although operations at it might be carried on more gradually. If, on the other hand, you consider that more should be left for private enterprize to supply, it will be for consideration whether the Mailkoondah site should be given up altogether. The land is, as Mr. Markham declares, "the best site for a chinchona plantation that has yet been selected," and will sell well. Considering the short distance of the Mailkoondah plantation from Ootacamund, Pykara, and Naddiwuttum, we do not see any advantage in retaining it solely for the purposes of propagating plants to be distributed gratuitously to private individuals, as proposed by Mr. Markham. Our means of propagating plants at Ootacamund are amply sufficient to meet all demands, and can, if necessary, be extended; and obviously it is more economical and effective to maintain one large propagating establishment at the superintendent's head quarters than to keep up several at different places. We shall, as speedily as possible, have a good road made to the Koondahs, and if the plantation be abolished, private individuals will be able to procure their supplies of plants from Ootacamund, easily and cheaply, and will be relieved from all competition on the part of Government in the labour market. We are clearly of opinion that the Mailkoondah plantation should either be retained, in addition to the others, or be sold. The intermediate plan recommended by Mr. Markham does not, in our judgment, hold out any advantages commensurate with the expense, &c., that it will entail.

We beg to be favoured with your early instructions on this question, as well as on the extent of land to be cultivated and reserved at the other plantations.

III. The gratuitous distribution of plants and seeds to all applicants. We are unable to concur with Mr. Markham in this proposal.

500 rupees for 1,000 plants.
300 " for 500 ditto.
200 " for 150 ditto.
100 " for 50 ditto.
4 rupees per plant for any number under fifty.

Note. The number planted out in the Government plantations, the requirements of which have of course been first met, is 244,000.

In 1863 Mr. McIvor proposed the scale of prices marginally noted, ranging from four rupees to eight annas per plant. We, however, considered four annas or sixpence per plant, whatever number might be taken, sufficient; and, in September last, we reduced the rate to one anna or three halfpence per plant when 5,000 or more were taken, and two annas or threepence per plant for less than that number. Mr. McIvor's last return shows that up to the 31st December last (when the reduction of price could not have had much effect) nearly 84,000 plants had been distributed. We consider an uniform price preferable to one graduated according to the number of plants taken, where, as in this instance, the price is regulated by the cost of production without reference to profit. Moreover, at the present rate, a person who actually requires only 3,000 plants finds it cheaper to buy 5,000, and throw away the surplus 2,000. We have therefore desired Mr. McIvor to charge one anna per plant whatever number may be taken, but, beyond this, we do not think it advisable to go at present. We have desired Mr. McIvor to submit his views on the question. The introduction of the chinchona, it must be remembered, has cost the State a large sum, and the simplest mode of recovering the money expended in producing the plants is to levy a price on them; and, as the cultivation of the chinchona promises to be highly remunerative, there can be no valid objection to the trifling charge we make. We believe that, as a general rule, articles that have to be bought are more cared for than those which can be procured *ad libitum* for nothing; and we would further remark, that if we are to distribute plants gratuitously, the work of propagation will be left entirely to us. No private individual will undertake the labour, expense and risk of raising plants for himself, or for sale to others, if they can be procured free of charge from our establishments.

IV. The adoption of vigorous measures, in a variety of ways, to induce the inhabitants of feverish tracts to include the chinchona among their products, both for their own consumption and for sale.

We are by no means insensible to the importance of this, but it is a measure which cannot be forced, and our experience makes us less sanguine than Mr. Markham, of the rapid or general success of such steps as he suggests. The culture of chinchona will doubtless pass through the same phases as the culture

Neilgherries - - -	67,302	North Arcot - - -	107
Bengal and North West	6,127	Cochin - - -	100
Coorg - - -	4,236	Reunion - - -	51
Wynad - - -	3,217	Punjab - - -	50
Travancore - - -	537	Algiers - - -	45
Bombay - - -	289	Vizagapatam - - -	35
Burmah - - -	270	Madras - - -	24
Goa - - -	252	Mysore - - -	24
Java - - -	231	Melbourne - - -	28
Nagpore - - -	197	New Zealand - - -	23
Canara - - -	157	Malabar - - -	12
Shervaroys - - -	150	Pulneys - - -	12
Mauritius - - -	108	Jamaica - - -	2

of other exotics: coffee, for example, which is now so extensively grown by native agriculturists. We annex a table showing the distribution of the plants sold; and you will observe from it that, as was to be expected, the great bulk of the plants have been purchased by residents on the Neilgherries, where there is so large an extent of land specially adapted to the chinchona, and unsuited to its present rival, coffee, and where also the singular success attending the cultivation of the plant is so well known, and the expenses and risk of conveyance are comparatively so trifling. Elsewhere, naturally enough, the demand has as yet been small; but 4,000 plants have gone to Coorg and 3,000 to Wynad, and this in tracts so well adapted for coffee is by no means discouraging, considering that only two years have passed since plants were procurable. From these localities the cultivation will spread gradually to every place where the soil and climate are favourable, and we believe that the greatest impulse will be given to its diffusion by our distribution of the medicinal product of the tree. As soon as the people are convinced of the efficacy of quinine (the very name of which is unknown to thousands) they will take to the culture of the plant with avidity. We beg to draw your attention to the marginal extract from Mr. McIvor's last annual report,* as showing that we are scarcely yet

* "The majority of English gentlemen engaged in cultivation on these hills, from want of experience, have been unsuccessful in propagation, and also in transplanting these delicate plants, although qualified to carry on the cultivation successfully when the plants are established or delivered

yet in a position to carry out such extensive measures as Mr. Markham suggests, and that we should incur considerable risk of failure if we were to make a distribution of such delicate plants to unskilled ryots. We shall impress on Mr. McIvor the absolute necessity of sending out well-established plants only. As soon as a sufficiency of these is available, we shall adopt measures to induce the people to cultivate the chinchona, but any expectation of such an immediate and universal spread of its culture as Mr. Markham contemplates is little likely to be fulfilled.

We do not consider it desirable to adopt Mr. Markham's suggestion, that a person selected by Mr. Levinge, the collector of Madura, should be sent, at the public expense, to Ootacamund, there to receive instruction in the cultivation of chinchona, which he is afterwards to carry out on the Pulney Hills. Mr. Levinge, as a covenanted civilian, cannot hold land or engage in agricultural pursuits, and his duties as collector and magistrate preclude his residing on the Pulneys (distant 44 miles from the head quarters of his large and important district), or even visiting them with sufficient frequency and regularity to supervise such operations. As yet there are very few Europeans holding lands on these Hills, and we cannot think it expedient that Government should extend their operations beyond the Neilgherries. We can always distribute the febrifuge cheaply and, if necessary, gratuitously, and it is not desirable that we should engage as cultivators of the chinchona in other localities.

V. The immediate location of convicts at Neddiwuttum. Our Judicial Proceedings noted in the margin will show you what measures we have adopted with this end, and that our difficulty has been to provide for the safe-guarding and medical care of the convicts in such a remote locality. The Inspector General of Gaols is now at Ootacamund arranging for the immediate transfer, if practicable, of convicts to Neddiwuttum.

	Proceedings, 3 August 1864, Nos. 60-02.	
"	4 Dec. 1865	" 21-24, Judicial Dept.
"	15 Jan. 1866	" 183, 184.
"	26 Jan. "	" 455, 456.
"	6 Feb. "	" 74, 75, Judicial Dept.
"	20 Feb. "	" 383, 387.
"	5 March "	" 60, 61.
"	8 March "	" 148, 149.

6. We enclose a communication from Dr. Cleghorn, our conservator of forests, containing a memorandum on the garden of his Highness the Maharajah of Travancore, at Peermade. We have, as you will perceive, instructed Mr. McIvor to afford every assistance sought by the Resident. Proceedings, 21 Feb. Nos. 405, 406.

7. We beg to be furnished with three copies of Mr. Howard's work "Illustrations of Nueva Quinologia of Pavon."

— No. 85. —

From *Clements Markham, Esq.* to the Secretary to Government, Revenue Department, Fort St. George.

Ootacamund, 16 January 1866.

1. WITH reference to paragraph 8 of the Despatch from the Secretary of State for India, dated 30th September 1865 (Public, No. 27), I have the honour to submit my views on the subject of chinchona cultivation for the consideration of his Excellency the Governor of Madras in Council.

2. The objects of the Secretary of State in sanctioning the measures which I adopted for the introduction of chinchona plants into India, and in causing plantations to be formed on the Neilgherry Hills, were the provision of an abundant and cheap supply of the febrifuge derived from them for the use of hospitals and troops in India, and the spread of chinchona cultivation throughout the Hill districts, in order to bring the remedy within the reach of all classes of the native population. His views on this point are distinctly stated in Despatches dated 16th January 1863 (paragraph 4), and 30th September 1865 (paragraph 5).

3. Two

to them in such a condition as to be easily transplanted. Our recent improvements in the preparation of the young plants will enable us to deliver them in such a condition as they cannot well be injured in transplanting."

3. Two preliminary steps have now been successfully taken towards the attainment of these important ends. The most valuable species of chinchona have been introduced from South America into India, and, thanks to Mr. McIvor, they have been converted from wild into cultivated plants. But the actual work which will lead to the attainment of the desired results has yet to be done. The ground has been most ably and zealously cleared. Six years ago chinchona plants, with the exception of 250 in Java, where wild forest trees, and their bark was only procured by perilous searches in the trackless wilds of the Eastern Andes; while a product so obtained was necessarily sold at a price which put it beyond the reach of millions of sufferers from fever. Now the most valuable species are cultivated on plantations in India; their habits and requirements have been successfully studied, and the best method of producing the largest amount of febrifuge alkaloids in the bark has been ascertained beyond a doubt. It remains to discover the most economical and efficient method of bringing the febrifuge product of the bark within the reach of the people of India, and to adopt such measures as will achieve this result. The consideration of these points has engaged my attention for several years, but I was unable to arrive at any definite conclusions until I had personally inspected the plantations, and had fully discussed the numerous difficult and complicated questions involved in this great undertaking, with Mr. McIvor. I now propose to submit certain recommendations for the consideration of his Excellency in Council, 1st, with regard to the treatment of the bark harvest; and, 2nd, in connection with the spread of chinchona cultivation.

4. But, before entering upon the main subjects of this report, I cannot refrain from an expression of my admiration at the ability and zeal with which Mr. McIvor has conducted the operations connected with chinchona cultivation. The results he has attained are altogether unprecedented in the annals of arboriculture. The information respecting the plants, which was available for his guidance, was very scanty. I and other South American travellers were able to furnish him with more or less complete details respecting the climate of their native habitat; the elevations at which the different species should be planted; and their habit of growth in the forests of the Andes. But we could only tell him of forest trees engaged in a struggle for life with their neighbours, and, therefore, growing under very unfavourable circumstances for the elaboration of the precious alkaloids in their barks: he, with the aid of such data as we could supply, had to discover the numerous requirements of the plants when under cultivation, and the treatment which would be most favourable for the formation of the alkaloids. The success he has attained in the short space of five years is quite astonishing. It may be seen in the ravines of Dodabetta, where the species which cured the Countess of Chinchon is flourishing in a fashion such as was never known on the heights of Uritusinga or Cajanuma. It may be seen from the falls of Pycara, where an avenue of beautiful trees will soon relieve the sombre sameness of a scrubby Neilgherry sholah. It may be seen far and wide along the slopes of the Neddivattam Hills, and it will soon be visible in the rich and fertile soil of the Mail Koondah forests. It is with no ordinary feelings that I have seen all this, and have been gratified with the thought that days of toil and nights of fever in the Caravayan forests, and subsequent weeks and months of intense anxiety, have been so fully repaid. We, who have laboured in South America, are amply rewarded for our work by the knowledge that it has been taken up and continued by so skilled and talented a cultivator as Mr. McIvor. I was particularly struck with the thorough and complete way in which all work has been done on the plantations. The buildings, roads, bridges, and arrangements for drainage are all excellent; and the system of management which has been established is manifestly working admirably.

5. It is unnecessary that I should touch upon the numerous points connected with chinchona cultivation, which are fully discussed in Mr. McIvor's reports. His method of propagation is most successful; and his system of planting in the open, instead of under shade, could never have been questioned if the opinions of those who were personally acquainted with the chinchona forests had been regarded; but the more recent conclusions at which Mr. McIvor has arrived are so closely connected with the questions relating to the treatment of the bark harvest that they necessarily come within the scope of my remarks. I now proceed

ceed to lay before his Excellency in Council the conclusions at which I have arrived respecting the treatment of the bark harvest.

6. The growth of the trees in the most advanced of the plantations—the first Denison—is remarkably rapid, especially as regards the increase of girth, and the development of bark. The species which has most completely naturalised itself in India is undoubtedly the *C. succirubra*. I found the finest trees of this species to average, under favourable conditions, a height of 6 feet and a girth of 6 inches in the first year, of 10 feet and 13 inches in the second, and of 15 feet and 15 inches in the third. But it is in the thickness of the bark and the increased yield of alkaloids that the most marked results have been obtained, and Mr. Howard's analyses have shown that the method of mossing the stems, which is adopted by Mr. McIvor, secures the largest attainable deposit of alkaloids in the bark, as well as its most rapid and effectual renewal. This will perhaps be most readily seen by the examination of a table showing the yield of unmossed and mossed bark (both original and renewed) at different periods of growth, as follows:—

C. SUCCIRUBRA.

Age of Bark.	Mossed Bark.			Unmossed Bark.			Renewed Bark.	
	Time under Moss.	Purified Alkaloids.	Crystallized Sulphates.	Chinchonine.	Purified Alkaloids.	Crystallized Sulphates.		Chinchonine.
Years.	Months.	Per Cent.			Per Cent.			
1	6	3.40	2.80	0.60	2.59	-	-	Renewed bark aged 1 year on a tree aged 3 years, yielded 9.72 per cent. of purified alkaloids, 2.72 of crystallized sulphates.
2½	12	6	5.20	0.80	5.06	2.43	-	Renewed bark aged 1 year and 5 months on a tree aged 3 years, yielded 7.7 per cent. of purified alkaloids, 5 of crystallized sulphates.
3½	11	8	6.94	1.06	-	-	-	Dr. de Vry obtained 11 per cent. of alkaloids from the same sample.
3½	18	-	11.34	-	-	-	-	The renewed bark which gave 2.72 per cent. of crystallized sulphate when 1 year old, on a tree aged 3 years, gave 5.85 when 18 months old.

It will thus be seen that the yield of valuable alkaloids on a tree of this species, aged two and a half years is 2.43 per cent. when unmossed, and 5.20 when the bark has been mossed for a year; and that the yield of mossed bark is steadily on the increase from 2.80 when the bark has been mossed for six months on a tree a year old, to the altogether unprecedented result of 11.34 per cent. when the bark has been mossed for 18 months on a tree three years and a half old. The yield from renewed bark is equally promising, giving 2.72 per cent. of the valuable alkaloids when one year old, and 5.85 when 18 months old. These results give us the certainty that the correct method of treating the chinchona trees is to cover the stems with moss, to remove the bark in strips periodically, to renew the bark by the mossing system, and to allow the tree to continue growing until it attains to its utmost size. We have not yet ascertained the extreme limit of the possible yield of alkaloids from this species, but it seems certain that it is still rapidly on the increase. It grows in perfection at an elevation of from 4,000 to 5,000 feet above the sea. At a lower elevation the bark is naturally much thinner and less rich in alkaloids, yet there is every reason to expect that even on coffee plantations, at 3,000 feet, the adoption of

the mossaing system will lead to the production of bark which will give such a return as to make the cultivation profitable.

7. Although the above system of cultivation is undoubtedly the one best calculated to give the largest returns, and therefore the one that must be adopted on the Government plantations, as well as on all private estates where care and skill can be bestowed on the cultivation; it will yet require extreme attention and the personal superintendence of an instructed cultivator. Some simpler method must be taught to the numerous native chinchona growers, who will, I trust, soon commence work throughout the hill districts; as well as to planters and others who merely raise the trees for the sake of supplying a febrifuge to their coolies. In such cases I would recommend the system which his Excellency the Governor has proposed in paragraphs 9 and 10 of his Minute, dated 30th October 1865, and which will, I have no doubt, prove both profitable and perfectly simple in practice. In wandering through the chinchona forests, both in 1853 and 1860, I of course encountered thousands of stems of felled trees, and in every instance I observed that fresh shoots had been thrown up, and had frequently grown into decent sized trees. During my visit to Hak-galla in Ceylon, I examined the stem of a *C. succirubra* tree which had been cut down in April 1864, and observed exactly the same thing, a shoot had sprung from the stem, and grown up quite straight to a height of five feet, with a girth of five inches near the ground. The same thing has taken place on the Neilgherries on every occasion when a chinchona tree has been cut down, and there is an excellent example of the vigour with which these shoots grow, in a tree growing amidst brushwood, just outside the gates of the first Denison plantation. It is a clearly ascertained fact that the felled stumps do send up vigorous shoots in this way, and we know that they may be periodically cut down, and that, by treating the bark with moss, a large per-centage of alkaloids will be annually obtained, as the shoots reach the age of three or four years. While then the more profitable, though more difficult and scientific, system is adopted in the Government Plantations and in all large undertakings, the coppice-wood method of cultivation will perhaps be more extensively resorted to by the numerous class of growers, who will raise bark for their own immediate use.

8. I observed that the *C. succirubra* trees at Neddivattam exhibited two varieties, one with the usual pink flowers and rich green leaves, the other with nearly white flowers and paler leaves. It is important that the cause of this difference should be clearly ascertained, as a full knowledge of all phenomena connected with the growth of the trees is of consequence to the cultivator. This is one of the numerous points which require investigation by a scientific quinologist on the spot, a subject on which I shall dwell more fully presently.

9. With the *C. succirubra* grow the various species which yield grey bark, and which seem in India to be generically known as *C. micrantha*. I may remark, in passing, that India owes the possession of this very important group of chinchona species to the measures taken by Mrs. Markham at Arequipa. (See "Chinchona Blue Book," pp. 119-23.) The *C. micrantha* grows with and at about the same rate as *C. succirubra*, averaging a height of 10 feet, and a girth of 12 inches when aged two years, and of 13 feet with a girth of 13 inches at three years. I have spoken of this species as important, because, whereas in its native forests of Huanuco and Huamalies, it yields almost exclusively the chinchonine, an alkaloid of inferior value as a febrifuge. Mr. Howard has found that, under cultivation, the chinchonine almost disappears, and that in its place the *C. micrantha* bark yields an extraordinarily large per-centage of the valuable alkaloid, quinidine. The effect of mossaing on this bark is also as marked as it is on that of *C. succirubra*. Unmossaed bark (aged two and a half years) of *C. micrantha* yielded only 1.83 of alkaloids, while bark of the same age, after it had been mossaed for a year, gave as much as 7.52 per cent. of alkaloids, of which 5.82 was of the valuable sort. This is a very significant result. Here is a kind which is almost worthless in its own forests, but which, under careful cultivation, has been made to substitute the efficacious quinidine for its wild product chinchonine. Though it will probably never yield quinine, *C. micrantha* may now take its place on almost an equal footing with *C. succirubra*, and these two valuable species will form all the plantations at a lower elevation than 6,000 feet. The exact influences which have produced this extraordinary change in the products of *C. micrantha* bark
are

are possibly hit upon in Mr. McIvor's interesting and very able letter to your address, dated 24th November 1865 (No. 105); but it is quite essential that the progress of the cultivator should be assisted and guided by the investigations of the chemist, and these investigations must be made on the spot both with green and dried bark, and with plants growing under various circumstances. Without this aid the ablest cultivator must move more or less in the dark.

10. The *C. calisaya*, the most famous of all the South American bark trees, and which in its native forests is alike the most beautiful and the richest in quinine, has not been a success in India. I was grieved to see the plants of this species only five feet ten inches high, and six and a half inches in girth, at an age of three years, while their stunted and shrubby appearance, with dim coloured leaves, is as different as possible from that of the glorious calisaya of the caravayan forests. Mr. Howard's analysis of the Neilgherry calisaya bark is also exceedingly disappointing. Yet there can be no doubt that we have the true species, for the plants at Neddivattam are descended from those procured by Dr. Weddell himself in the forests of Caravaya and Bolivia. There will soon be a large supply of calisaya seedlings, both from the trees themselves and from the seeds obtained by Mr. Money, and a further extensive and careful trial of this most valuable species may be made. But here again the assistance of a scientific quinologist is essential, in order to discover and counteract the influences which have hitherto been so inimical to the development of *C. calisaya* on the Neilgherries.

11. The plantations at a higher elevation than 5,500 or 6,000 feet above the sea, and up to 8,350 feet, will consist of the several varieties of *C. officinalis* of Linnæus, and of the trees (*C. lancifolia* and pitayo) yielding the precious barks of new Granada. So long as they are kept clear of the severe frosts of the valleys, the plants of *C. officinalis* flourish luxuriantly on the higher slopes of the Neilgherries, and indeed they are now the most numerous of all the species. The effect of mossaing on the product of the bark of *C. officinalis*, known in commerce as crown bark, has been most satisfactory. From a tree a year and a half old, unmossaed bark gave a total of only 1.50 per cent., of which nearly half was chinchonine; while bark that had been mossaed for four months yielded 2.408 of quinine alone. The unmossaed quills of this bark, known to the trade as Colorado del Rey or rusty crown, will already fetch 1 s. 3 d. to 1 s. 4 d. per lb. in the London market. They are very much used by chemists in making bark preparations. The species is evidently capable of much improvement, it flourishes on the open grass land as well as in that of the sholas, and I am convinced that *C. officinalis* plantations will be very remunerative. *C. lancifolia*, of which there are now about 160 plants, is also valuable, and the undescribed species yielding the pitayo bark is by far the richest in alkaloids of any yet discovered. Even in its wild state the bark sent home with seeds collected by Mr. Cross, yielded 11.34 per cent. of alkaloids, of which 5.85 was quinine, 4.19 quinidine and chinchonidine, and only 1.30 chinchonine; and parcels in the market are selling at prices 10 per cent. higher than those of calisaya bark. The piñon de pitayo bark belongs to a hardy tree which will flourish with *C. officinalis* on the higher slopes of the Neilgherries, Pulneys, and Koondahs; and, when treated with moss, it will increase even its present enormous yield of alkaloids. Knowing the great importance of introducing this species, I have made numerous attempts to procure seeds, and during the last two years I have engaged Mr. Cross to collect them in the neighbourhood of Popayan. That energetic gardener has at last forwarded a small instalment of these precious seeds, and we are now watching in great anxiety for signs of their germination. I enclose a copy of Mr. Howard's report of an analysis of the pitayo bark forwarded with the seeds. Enclosure, No. 1.

12. Having offered the above remarks on the most recent results of cultivation with regard to the different species of chinchona, I now proceed to discuss the main subject of this section of my report. The method of taking the bark from the trees has been fully explained by Mr. McIvor in the specification of a patent which he has recently taken out. There are, however, several complicated questions relating to the best way of drying it and preparing it for the market, which we have considered and discussed together, but which cannot be finally settled until we have the aid of an experienced quinologist who can try experiments on the spot.

13. Here the work of the chinchona planter is completed. His bark is ready for the market, and he only has to obtain the best price he can for it. But it is only here that the most important part of the measure undertaken by the Government commences. The principal object of the Secretary of State was to provide a cheap and abundant supply of the febrifuge for the people of India. The problem to decide is, therefore, the form which the bark should take after it has been harvested, in order to attain the great and beneficent end in view.

14. Long before quinine was discovered, decoction of bark had cured thousands of sufferers from fever; and this simple form of the febrifuge is destined, I trust, to prove a blessing to many a fever-haunted district of India. Its manufacture is so simple that it may be carried on by every family that has a few trees planted at its door. It is merely necessary to pound the bark up until it will pass through a rather fine sieve, mix in the proportion of about ten ounces of bark to one gallon of water, boil, and strain off.

15. It is very desirable, however, that the alkaloids themselves extracted from other ingredients of the bark, should be brought within the means of the poorest native family, and until this is done chinchona cultivation in India is not a perfect success. To suppose that this can be effected by sending bark to England, to be turned into quinine and sent out again for sale at 20 shillings an ounce, is absurd. It is essential that some rougher and cheaper way of extracting the alkaloids should be hit upon, since the cost of producing the crystallised sulphates put them out of the question; and I have devoted much anxious thought to the consideration of this important point. I have now no doubt whatever that the alkaloids can be extracted in a form which will lead to the desired result, and further investigations will show what preparation is cheapest and most efficacious. Meanwhile, my own opinion, founded on actual experiment, is that the preparation called quinium will solve the question.

16. Numerous attempts have been made, from time to time, in South America, to extract the alkaloids roughly, in order to escape the expense of paying freight for so bulky an article as bark. Something of the kind was tried at Loxa in Ecuador; a Frenchman ruined himself in an attempt to establish a manufactory for this purpose at Puno, on the banks of lake Titicaca; and an Italian, at La Paz in Bolivia, actually invented the preparation called quinio or quinium, and gave some to Von Tshudi, the well-known German traveller. The method was afterwards adopted by M. de Londre of Havre, and in the French works on pharmacy it is called "*Extrait alcoolique de quinquina a la chaux.*" I received a practical lesson in the manufacture of quinium from an eminent chemist in London, and the process is so simple that a brief account of it will not be out of place here.

17. The method we used differed slightly from that described in the *Journal de Pharmacie et de Chimie*, Tom. 33 (1858), p. 73. The object is to separate the alkaloids from the lignin, gum, starch, acids, colouring matter, and other ingredients of the bark. The first process is to mix the pounded bark with half its weight of slaked lime and a little water, and this mixture is allowed to stand for a few days in order to give time to the lime to work thoroughly. The lime takes up the acids, colouring matter, and other parts of the bark. The mixture is then treated with strong spirits and boiled. The febrifuge alkaloids are soluble in alcohol, so that when the liquor is strained off, it consists of spirits with all the quinine, quinidine, and chinchonidine contained in the bark, in solution. It then only remains to distil off the alcohol, and the residuum is the quinium, containing all the febrifuge virtue of the bark. In my experiment in London, 1,000 grains of calisaya bark yielded 68 grains of quinium, a pale brown substance, in appearance not unlike glue, which contained 33 per cent. of quinine.

18. During my stay at Ootacamund I have tried a similar experiment on a much larger scale, with bark and leaves of *C. succirubra* grown at Neddiwuttam. Mr. McIvor gave me his active assistance, and furnished a small still and the other necessary apparatus and ingredients. We mixed 10 lbs. of pounded bark with 5 lbs. of lime, and 6½ lbs. of leaves with 3½ of lime. To this was added 30 bottles of arrack, which was strained and distilled off, and a very satisfactory

satisfactory residuum of quinium was obtained. It is of a reddish colour, as a portion of the colouring matter of *C. succirubra* is soluble in alcohol. The cost of the slaked lime is a mere trifle, only 30 measures to a rupee, which is sufficient for the treatment of 75 lbs. of bark. More than two-thirds of the alcohol is recovered by distillation, so that the actual cost of a bottle of arrack at one rupee is not more than four or five annas, probably much less when quinium is manufactured on a large scale. I shall have the quinium which we have obtained very carefully analyzed, but I have already ascertained that it is a strong febrifuge. It can be made up into quinine pills, each containing two to three grains, and a rough calculation leads me to the conclusion that it can eventually be sold at a few annas the ounce. The manufacture is so simple that it can be taught to all native dressers, and made without expense or trouble at hospitals and dispensaries.

19. Although I would not venture to give a positive opinion until the whole subject has been investigated on the spot by a competent quinologist, I yet think that quinium manufactories at every place where there is a local supply of bark will lead to the achievement of the great object of chinchona cultivation in India, namely, the provision of an abundant and cheap supply of the febrifuge in all fever districts; but there is one consideration which at first sight would appear to be fatal to success, and which therefore requires attention. It would naturally be supposed that if the alkaloids can be extracted in the form of a quinium at an exceedingly cheap rate, the tendency of speculators will be to buy it all up for sale to quinine manufacturers in the European markets; this, however, will not be the case, because quinium is not saleable for manufacturing purposes. It is for this very reason that I anticipate success from the manufacture of quinium in India. The failure of all attempts to substitute quinium for bark in the South American trade convinced me that the same result would attend similar attempts in India, and thus there is no danger that the plentifulness and cheapness of the febrifuge in this form can be interfered with by unscrupulous speculators.

20. The reasons why quinium, though containing all the febrifuge virtue of the bark, and therefore an efficacious medicine, is of no use to the quinine manufacturer, are partly explained by Mr. Howard in the last paragraph of his report of an analysis of bark, dated 15 June 1864: "Importers," he says "reap in the end more profit from sending into the European market the raw material than the half manufactured product." The lime process has a deteriorating effect on the crystallizable properties of the alkaloids (which is what the manufacturers require), although their medical efficacy remains unaltered.

21. Dr. de Vry, the eminent quinologist, has told me of another preparation from the bark, which he is inclined to think will be more conducive to the objects in view than quinium. The process of making it is described in his report on some bark which I sent to him last July, a copy of which is herewith enclosed, it being the same as was adopted in that analysis. The ingredients required for the manufacture are diluted muriatic acid, which costs in England when bought by the carboy of some gallons, 2*d.* per lb.; solution of caustic soda, and apparently alcohol. But the expense of the chemicals will be very slight, two lbs. of muriatic acid and one of caustic soda being required for the treatment of a cwt. of green, and about double that quantity for dried bark. The preparation is in the form of a fine powder, which consists of all the febrifuge alkaloids of the bark.

Enclosure, No. 2.

22. I have entered into these details in order to demonstrate that a cheap medicine can be obtained from the bark, for the use of the working classes of India, which will practically be as efficacious as the expensive sulphate of quinine. It will be for a skilled chemist, in concert with the cultivator to decide, after careful consideration, whether the febrifuge powder of Dr. de Vry, or the quinium, or some other preparation is the one to be adopted for general use. My purpose now is to show clearly that the great end which was contemplated when the chinchona plants were introduced into India is by no means difficult of achievement.

23. One measure is, however, absolutely necessary for the success of this great undertaking. The cultivation of chinchona plants has now arrived at a

stage when the co-operation of a scientific quinologist with the cultivator has become of vital importance. There are numerous questions connected with the growth of the plants, with the elaboration of the alkaloids, with the drying of the bark, with the period when the bark has reached its highest per-centage of alkaloids, and with the manufacture of the febrifuge, which must be solved, and which can only be solved on the spot. I have indicated some of these points in paragraphs 8, 9, 10, 11, 12, 13 and 22 of this report. Indeed it is impossible to consider the subject of chinchona cultivation attentively, without seeing reason at every turn for the conclusion that the assistance of a skilled analyser and chemist, on the spot, is urgently required at this stage of the experiment. The enclosed Memorandum by Dr. Cleghorn will show that such a measure would be of great utility in various ways, independently of its principal object.

Enclosure, No. 3.

24. I would, therefore, strongly recommend that a quinologist of established reputation should be appointed to conduct the investigations above indicated, in concert with Mr. McIvor, say for three years. His duties, in addition to these investigations, would be to decide upon the form in which the febrifuge could be most economically and efficaciously prepared; to instruct medical subordinates and others in the method of manufacture, and to report whether or not it would be advisable to establish a manufactory of the sulphate of quinine itself in this country. In deciding upon the pay and allowances that should be attached to the appointment, there is, I believe, a good precedent in the office of Chemical Reporter in the North West Provinces.

Professor of Chemistry at Roorkee.

25. It is quite possible that, after all, it will be found advisable to establish a Government quinine manufactory here; but we have no data at present to form a decided opinion on that point. If such a measure is resolved upon, it will be a great boon to the planters, because they will be able to dispose of their bark at once; and to the natives, because the cheaper febrifuge will also be largely manufactured, while the refuse of the manufactory, in the form of quinoidine, can almost be given away in any quantity.

26. I would not venture to express any further opinion respecting this appointment if it was one of an ordinary character; but in truth the number of men who are capable of filling it is so exceedingly small that the choice is narrowed, so far as I am aware (and I have made diligent inquiries), almost to one man. There are several learned quinologists in Europe, some like M. Delondre, in extreme old age, while others, such as Dr. Phœbus, M. Guibourt, Mr. Weddell, Mr. Howard, Mr. Hanbury, Carl Zimmer, &c., are not in a position to accept an offer of this kind. But in Dr. J. E. de Vry, the well-known Dutch quinologist, who has already visited the Neilgherry plantations and analysed our barks, we have one of the first practical quinologists of the day, who is deeply interested in the present experiment, who has devoted many of the best years of his life to the study of the chinchona plant and its products, and who has been acclimatised in the tropics. I beg respectfully to suggest that, in the event of my recommendations being adopted, this appointment be offered to Dr. J. E. de Vry, whose services are, I happen to know, now available.

27. The 2d section of my report refers to the spread of chinchona cultivation throughout the Hill Districts of India, a portion of the undertaking which I believe to be of the first importance; because, by this means alone can the inhabitants of fever-haunted districts obtain the necessary supplies of bark without trouble or expense. There are two modes by which chinchona cultivation will be extended; the one by the operations of planters, the other by the action of Government officials, or by means of any machinery that may be available in the districts which are suitable for the growth of Peruvian bark.

28. I am desirous most earnestly to represent that the object in introducing chinchona cultivation into India was not to show that the culture would prove remunerative, and that the prospects will be such as to encourage private enterprise. Private enterprise should be encouraged in so far as it tends to spread chinchona cultivation in the various hill districts; and to this extent it will undoubtedly further the great objects of this national undertaking. But in some respects

respects the interests of the planter and the Government must be antagonistic. The Government must look to the medicinal, the planter to the pecuniary value of the bark. The planter merely desires to get a rapid return for his money and to keep up the price of bark. The object of the Government, on the other hand, is not to make money, which is no part of its functions, but rather to reduce the price of bark as low as possible, and to bring its use within the means of the poorest coolie in the land. It was to provide an abundant supply of the chinchona febrifuge for the people that the Secretary of State introduced this cultivation into India, and not to afford another means of making money to European speculators. But, while seeking his own profit, the planter does good service in extending the area of cultivation, and from this point of view alone can the interests of private enterprise be considered in connection with the Government measures relating to this subject.

29. Not only will extensive private plantations more or less conduce to the spread of the use of the chinchona febrifuge amongst the labourers employed upon them, but they will also open up important tracts of hitherto neglected country, and add to the revenue at the same time that they increase the general wealth of the community. Now that analysis has proved the value of bark grown in India, there seems to be every disposition on the part of planters to undertake its cultivation. As many as 84 pieces of land have been taken up on the Neilgherry hills, under the Waste Land Rules of 6th March 1863, covering more than 8,000 acres; and there are very few indeed of the purchasers who have not planted chinchona trees on their estates, while several intend to cultivate Peruvian bark exclusively, and on a very large scale. Many trees are also planted and growing well in the Wynaad district.

30. The Mail Koondah chinchona plantation will, from the planting point of view, be very important, because it will open up a new and magnificent country, and form a nucleus of propagation round which numerous flourishing private estates will congregate. It will thus, both directly and indirectly, prove a valuable source of revenue to the Government, and the completion of good roads to it will, in a very few years, give rise to the clearing and planting of many hundreds of acres in a hitherto absolutely unproductive district. The Mail Koondah plantation should not, I conceive, be more than 200 acres, and it should be used strictly for propagating purposes, on the same principle as that at Hakgalla, in Ceylon. In thus furthering the extension of chinchona cultivation, it will come strictly within the scope of the measure which is now producing such excellent results wherever its influence is felt.

31. The Koondahs are by far the finest hills I have yet seen in India. The forest cover their sides and crests, which bear more resemblance to the superb montanas altas of some parts of the Eastern Andes than to the scrubby sholas of the Neilgherries. The soil is of extraordinary depth and fertility, both in the forests and grass land, and there are abundant supplies of water. Indeed the scenery of these beautiful hills, the long lines of forest with all the varied tints of foliage, the rich grass land intervening here and there, the magnificent waterfalls and precipices, and the sharp peaked outline of the distant mountains—is far and away the finest I have yet seen in the Western Ghauts. The land reserved by Government is, I am fully convinced, the best site for a chinchona plantation that has yet been selected, superior either to Dodabetta or Neddivattam. The land is well protected from severe gales; three or four ranges of forest-clad hills mitigate the force of the south-west monsoon, while there is no land intervening between Mail Koondah and the low country to the eastward, to prevent the plantation from receiving a good share of the north-east rains. A bullock track on such a trace as could be hereafter converted into a cart road, may easily be made, to connect Mail Koondah with the old Malabar road, and this plantation will then be much nearer supplies and labour than any of the others. Burgher labour is already procurable on the spot. I would recommend that the necessary works and communications connected with the Koondah plantation (which has been named Stanley, after the statesman who first sanctioned my proposals respecting the introduction of chinchona cultivation into India) be pushed forward at once, so that plants and seeds may be ready for distribution as soon as possible. An estate of 400 acres has already been partly cleared, in an admirable position, within a short distance of the Government plantation,

and others will soon follow. The progress of the Stanley plantation, in opening up the Koondahs, as well as in spreading chinchona cultivation, is quite as important as that of any of the others.

32. The Government chinchona plantations are of course of essential use to private cultivators, by furnishing them with plants and seeds, by pointing out the best methods of cultivation, by eventually taking the lead in the European market, and establishing the fame of East India bark, and probably by, hereafter, in the manufacturing operations, taking part of the bark harvest off their hands. I have already discussed most of these points, but I think it right to offer my opinion on the subject of the disposal of plants and seeds. The great object of the Government is to introduce and spread chinchona cultivation, and I have long been of opinion that the plants and seeds should be given away to all who are desirous of growing them, without any charge. The exaction of payment for them, especially as there is a per-centage of loss on the plants delivered, must have the effect of retarding the spread of the cultivation. In Ceylon, the plants are given away, the only expense to the cultivator being the carriage to his estate. A planter desirous of undertaking the cultivation signs a form, stating that he has available land suitable for the growth of chinchona trees, that he undertakes to plant the trees delivered to him upon the said land within 12 months, and to carefully cultivate them when so planted. These forms are filed; a register, open to inspection, is kept of applications; and each applicant is supplied in his proper turn. This plan has answered admirably; as many as 50 planters have already commenced the cultivation in Ceylon; 5,00,000 plants have been applied for, and 1,80,000 have been actually distributed. The price charged for chinchona plants on the Neilgherries has been lately reduced to one anna each when 5,000 and upwards are taken, and to two annas each for any number under 5,000. Now 5,000 is quite sufficient for any one cultivator to take, as he can propagate from his own stock for any quantity above that number. I would recommend, therefore, that the price of one anna be charged, as now, for each plant when over 5,000 are applied for, but that any number under 5,000 be furnished to applicants without charge. A register should be open for inspection, so that every applicant can see that he is served in his turn, and each applicant should sign a form similar to that in use in Ceylon. The argument in support of the practice of charging money for the plants is, I am aware, that a man will take more care of what he has paid for than of what he has got for nothing. I believe the argument to be fallacious, and that while a careless man will take care of neither, a careful man will not neglect any of his property that is worth taking care of. Any how, the plan of giving away the plants has answered perfectly in Ceylon, where many planters are taking great pains with them. It is most important that no charge for plants should be exacted from native growers, or from such officials as may be desirous of inducing the natives in their districts to grow chinchona trees; and, as no difference can fairly be made between applicants, the system of charging for plants, when the number applied for is less than 5,000, ought, I think, to be abolished. The great harvest of seeds, which is expected next spring, should be as widely distributed as possible, with instructions for sowing and rearing them, free of all charge.

33. The chief object of introducing chinchona plants into India is to bring the febrifuge within reach of the classes who cannot afford to buy quinine, or nearly the whole of the sufferers from fever. This beneficent measure has hitherto received little or no attention, and scarcely any efforts have been made to induce the natives themselves to cultivate chinchona trees, to cause clumps of the fever-dispelling plant to rise up round every village in the hill districts, and to see that each family is able to obtain fever bark, and understands its use. Until active steps are taken in this direction, and general success has been achieved, the Government cannot pause, for its most important work remains undone. The Secretary of State has expressed his sense of the importance of this part of the undertaking on several occasions, but especially in his Despatch dated 16 January 1863, where he points out that the commercial advantages of chinchona cultivation are merely a secondary consideration, and desires that collectors be directed to introduce the plants into the hill districts of their collectorates.

34. I beg

34. I beg to enclose, for the information of his Excellency in Council, an extract from a letter which I have addressed to the Under Secretary of State for India, dated 26 December 1865, on the subject of chinchona cultivation in Travancore and on the Pulney hills, and to draw special attention to the extracts which I have quoted from the admirable Minute by Mr. Maltby, the late Resident of Travancore, on this subject. His enlightened measures with regard to the establishment of a chinchona garden at Peermade, with a view to the spread of the fever-healing trees throughout the hill region of Travancore, should be adopted with reference to all other mountainous parts of India. Enclosure, No. 4.

35. Endeavours should be made to induce all villagers in hill districts to include chinchona trees amongst their products, first for home consumption, and eventually for supplying bark to the villages and dispensaries in the adjacent plains. The machinery for effecting this would vary according to circumstances. Sometimes a collector or sub-collector would take a personal interest in a matter of such vital consequence to the people under his charge; at others a subordinate official or overseer in the forest department may take the work in hand; and it may be hoped that, at least in some localities, the natives, on receiving a little encouragement, will initiate the cultivation of their own accord. I would suggest that such slight assistance should be extended to these efforts by the Government as the circumstances may require, in order to secure satisfactory results.

36. For instance, Mr. Levinge, the collector of Madura, has successfully introduced some chinchona trees into the Pulney hills, at his own expense, with the intention of propagating from them, and I believe that Mr. Marden, of the Education Department, is seconding his efforts. A good beginning has here been made, and a little aid from the Government would ensure most important results. It is impossible for Mr. Levinge to be on the Pulneys for more than a few days at a time, while a little care bestowed on the matter from a permanent resident would lead to the cultivation of Peruvian bark at the very doors of every village in the fever-haunted lower Pulneys, and the growth of a surplus supply for the use of sufferers in the Cumbum valley and other parts. A measure of great utility to the inhabitants might thus be adopted at insignificant cost; and I beg strongly to recommend that the Government should pay the salary of a man selected by Mr. Levinge, who should receive instruction on the Neilgherries, and that a larger supply of chinchona plants be furnished for the experiment on the Pulneys. Mr. Levinge might be requested to submit his views on this subject.

37. If operations are ever commenced in connection with the Perryaur irrigation project, the opportunity should be seized of introducing chinchona cultivation into the forests near the banks of the Perryaur, for the use of coolies engaged on the works.

38. Then, again, the sub-collector in charge of the taluqs bordering on the mountains in Tinnevely might do much towards the introduction and extension of the growth of chinchona plants, and, if he is prepared to recommend any particular measure, a supply of plants and all other needful assistance should be furnished to him.

39. A great work, in connection with chinchona cultivation, will be done on the Annamallays at some future day. Extensive coffee operations have already been commenced at Ponachy, and the collector of Coimbatore may even now be able to recommend some measure, with a view to extending chinchona cultivation in that direction.

40. But I believe that the most useful work might be done in Wynaad, under the superintendence of the deputy collector, who has opportunities of explaining the value of chinchona cultivation to the natives, and who should be supplied with all the plants he may think it advisable to apply for. It seems very desirable that the views of the collector of Malabar on this point should be placed before the Government, and favourably considered.

41. The people of Coorg and of the Mysore mountains will, I have no doubt, avail themselves very readily of any opportunities that may be extended to them of obtaining and growing the chinchona; and I hope soon to submit a plan with this object in view, for the consideration of the Chief Commissioner. Any

number of plants and seeds that he may require will of course be furnished from the Neilgherry hills, in accordance with views expressed by the Secretary of State, in paragraphs 4 and 5 of his despatch, dated 16 January 1863.

42. If the above suggestions are favourably entertained by His Excellency in Council, and followed up from time to time as opportunities offer, a very great blessing will be conferred on the natives. The healing bark will be at their doors, and the powdered bark, or a decoction of it, will furnish them with an un-failing remedy for an otherwise incurable scourge. The work to be done is simple and easy; the good that will be effected is altogether incalculable. It is work that should take precedence of all fostering of private enterprise, and supplying of new investments for capital. Dr. Poeppig (*Reise II*, p. 223), in a passage which I have quoted in a note to my work (p. 506), gives testimony to the efficacy of the green bark as a cure for fever, from his own experience on three different occasions; and it is now in the power of the Madras Government to extend the blessing, then enjoyed by a solitary German traveller in Peru, to a great population of sufferers from fever in this country.

43. This, as it appears to me, is the work that remains to be done in connection with chinchona cultivation; and the necessary steps may now, I think, be foreseen, down to the time when the Government can fitly retire from active participation in it. Next to the measures suggested in the foregoing 10 paragraphs, the most urgent present work is the completion of the planting out of the 1,200 acres at the Neilgherry plantations. It will be advantageous, in every point of view, if this work is finished as quickly as possible; and the use of convict labour appears to be an excellent way of effecting this, while it is, at the same time, a convenience to the prison authorities. As I have had good opportunities of judging of the way in which this measure is working, during my recent inspection of the plantations, it may be useful if I state the impressions which I have received respecting it.

44. On 3rd August 1864, His Excellency in Council recorded an opinion that convict labour might with much advantage be made use of on the Chinchona plantations, and directed Mr. McIvor to submit plans for gaols, to accommodate 500 prisoners at Dodabetta, Neddivattam, and Mail Koondah. On September 6th, Mr. McIvor having completed the plans, his estimate of 21,225 rupees for the gaols, to be paid out of the Budget allowance for the plantations, was sanctioned; and the whole scheme was fully approved by the Government. The gaols are substantially built, and on an admirably devised plan both for health and security. That at Dodabetta consists of one, that at Neddivattam of two large and lofty rooms, with brick walls and roof, supported by beams of Angelly wood. Along each side, there are verandah rooms for dispensaries, offices, warders, &c., and the arrangements for guarding and inspection are very complete. The gaols have fire-places, the bed places are wooden planks raised 18 inches from the ground, and each prisoner has a rug and two cumblies. The drainage appears to be excellent. At the Dodabetta gaol there is a gaoler at 50 rupees a month, a head warder at 14 rupees, 4 warders at 10 rupees each (total salaries 104 rupees), and 17 policemen for 82 convicts. At Neddivattam there will be 6 warders and 32 policemen for 200 convicts.

45. The Dodabetta gaol was completed first, and the prisoners entered it on 20th September 1865, consisting partly of convicts from the low country, and partly of Chinese prisoners from the Straits Settlements; unfortunately, no one with proper authority was placed in charge of them. The joint magistrate at Ootacamund stated that it was impossible for him to visit the gaol, and Mr. McIvor had no powers. Thus, from the middle of September until the middle of December, the prisoners, I presume through some inadvertence, were left without any one but the gaoler to control them. The inevitable consequence was mutiny and insubordination. At last, in the middle of December, Mr. McIvor received powers, under the provisions of Regulation I. of 1833, as superintendent of the gaol at Dodabetta, and from that day, and not before, the experiment of using convict labour on the chinchona plantations commenced.

46. The result has, I think, fully confirmed the opinion of his Excellency in Council that convict labour might be made use of on the chinchona plantations with much advantage. Two or three days after Mr. McIvor took charge, there was

was an outbreak, the sure result of three previous months of anarchy. It was promptly suppressed, and the prisoners at once saw that good behaviour was their best policy. Ever since they have conducted themselves well; there has been no attempt at escape, no illness, no insubordination. They have worked well and cheerfully, and the experiment, now thoroughly tested, is a decided success. The clearest proof of this is to be found in the extra work done; for where there is a mutinous feeling or discontent, it is difficult to exact the regular tasks, while under the influence of opposite feelings, extra work is cheerfully done. The chief employment is pitting for Chinchona plants. Free labourers do 16 pits a day. The task of the convicts is to do 20 pits, of the Chinese 25 pits a day. For extra work they get half an anna for 5 pits. The native convicts average 7 pits a day of extra work each man, and the Chinese 8½ pits. If cheerfulness at work, strict subordination, and an absence of sickness and of any attempt at escape, are any test of the success of a system of managing convicts, these results have been achieved at Dodabetta gaol during the last month.

47. The successful experiment at Dodabetta supplies the assurance that the same results will be attained at Neddiwuttam gaol, if Mr. Melvor is invested with similar powers. The gaol at Neddiwuttam is now quite completed and ready for the reception of prisoners, and it is very important, for several reasons, that it should be occupied by convicts without delay. In reliance on convict labour, the free labourers have been employed on the gaol instead of on the plantation work. If therefore the convicts are not sent up, the work will be thrown back in the plantations, the nurseries will remain overstocked, and very serious loss will be the result. The sums spent on the gaol will also have been wasted. Then it will be absolutely necessary to obtain other labour at all hazards, in order to prevent the great damage which otherwise will ensue. The labour market will thus be entirely disorganized, and there will be much consequent inconvenience and distress. On the other hand, the various advantages arising from using convict labour on these plantations, such as the relief of the crowded state of the Southern gaols, the great saving of expense to the State, &c. will be lost.

48. Any fear that there are special facilities for convicts to escape from these gaols is founded on a misapprehension of the facts. It stands to reason that if the buildings are arranged with equal regard to safe keeping and inspection, and have the same machinery for guarding the prisoners, there will be exactly the same chances of escape on the plains as on the hills, no more and no less. But the arrangements for custody and inspection in the gaols on the Chinchona plantations are superior to those of gaols on the plains, so that there are less chances of escape in the former, while the probability of final escape is very small. At Mail Koondah it is almost impossible for a native convict to get clear away.

49. The gaol at Mail Koondah, an exact counterpart of that at Dodabetta, is very nearly completed.

50. With convict labour, the work of planting the 1,200 acres will be completed in a little over two years. During this time, the quinologist will be conducting his experiments and investigations, and, in concert with the medical authorities deciding upon the important questions connected with the manufactory of preparations from the bark. On the departure of the convicts, the three handsome and substantial buildings at Dodabetta, Neddiwuttam, and Mail Koondah will be available for bark stores and manufactories. The quinologist will then be able to continue his operations on a larger scale, to furnish abundant supplies of the febrifuge, and to instruct numerous apothecaries and dressers in the method of manufacture. Dispensaries in every part of the country will be able to obtain and prepare their own bark. At the same time, the most advantageous moment for sending home the rich febrifuge-bearing bark will have been ascertained, and East Indian bark will stand so high in the European market that Chinchona plantations will, on all sides, prove highly remunerative. Meanwhile the cultivation of the Peruvian bark tree will have been extended to the utmost possible extent throughout the hill districts of India, and the quinine febrifuge will have been brought within the reach of every sufferer from fever in the land.

51. When these results are fully achieved, the Government may fitly pause; then and not till then, will the work be concluded, and the Government be justified, by the sale of plantations and manufactories, in receiving back with interest the whole of its outlay. One of the greatest and most beneficent measures that any ruler has ever undertaken for any country will at last be fully completed.

52. Trusting that the foregoing remarks and suggestions, all of which I have very carefully and anxiously matured, will receive favourable consideration from his Excellency in Council,

I have, &c.
(signed) *C. Markham.*

Enclosure 1, in No. 85.

From *J. E. Howard, Esq., F.L.S.*, to the Under Secretary of State for India, dated 18 November 1865.

I HAVE the honour to report that I have examined the small packet of the fine red Piñon de Pitayo variety of bark, and find that it contains—

Sulphate of quinine - - - - -	5.85
Quinidine and chinchonidine - - - - -	4.19
Chinchonine - - - - -	1.30
	11.34

The total amount of alkaloids (after deducting the weight of sulphuric acid of the sulphates) may be given as 10 per cent. of the weight of the bark sent. This gives promise of an excellent result in the hands of Mr. McIvor, if the seeds should germinate in India.

Two parcels of this red Pitayo variety are in the market at the present moment, producing respectively, 5.00 and 4.70 per cent. of sulphate of quinine. The price asked for these, though less carefully selected than the packet sent by Mr. Cross, is about 10 per cent. beyond that of Calisaya. It will be seen from this that the bark is much esteemed in commerce.

I have also examined the packet of leaves sent, and find these to contain a proportion of alkaloid, on the exact nature of which I should be unwilling to offer an opinion, unless I had the opportunity of experimenting on a larger portion of the material.

(signed) *J. E. Howard, F.L.S.*

Enclosure 2, in No. 85.

REPORT on the Yield of two Chinchona Barks cultivated on the Neilgherry Hills, and sent to Dr. de Vry by Mr. *Clements R. Markham*, on 7 August 1865.

BARK, No. 1.*

THE bark dried at 212° Fahrenheit, and analyzed by my method ("Pharmaceutical Journal, August 1864"), yielded 3.16 grains of alkaloids, consequently 9.14 per cent., and 0.142 grains of quinovic acid, or 0.41 per cent. Of these 3.16 grains of alkaloids, 1.48 grains were dissolved by ether, consequently 4.28 per cent. of alkaloids, soluble in ether, was contained in the bark.

2. The part soluble in ether, saturated with oxalic acid, yielded beautiful crystallized oxalate of quinine, and left an uncrystallizable mother liquor, from which was obtained an amorphous alkaloid, which I have found in all the young chinchona barks that I have analyzed.

3. The part insoluble in ether contained no quinidine, whilst the sulphate, obtained by its saturation with sulphuric acid, crystallized like sulphate of quinine, and not like sulphate of chinchonine. I consider, therefore, that the part of the alkaloids of this bark which is insoluble in ether, consists chiefly, if not entirely, of chinchonidine. The presence of chinchonine could not be ascertained, for if this alkaloid really exists in the analyzed bark, its quantity must be relatively very small.

4. During

* The numbers are those attached to the samples of bark in the Memorandum accompanying Mr. McIvor's letter to the Secretary to Government (Revenue Department), dated 3 May 1865.

4. During my experiments, I observed the relatively large amount of chincho-tannic acid contained in this bark, and also the absence of chlorophyll.

5. The yield of alkaloids being greater than I expected, I was obliged to change the filter upon which the precipitate of the crude alkaloids, mixed with an excess of lime, was collected, by which operation I sustained a small loss. The amount of alkaloids in the bark is, therefore, greater than the obtained quantity of 9.14 per cent. This was proved by the following experiment.

6. Ten grains of bark dried at 212° Fahrenheit, were lixiviated in a narrow glass tube, so that the column of bark powder had a length of 10 centimetres, by 150 cubic centimetres of diluted hydro-chloric acid containing 4 per cent. of pure acid, which lixiviation lasted three days. The liquid obtained by this process was afterwards precipitated by 15 cubic centimetres of a solution of caustic soda, and the precipitate collected on a filter. After washing and drying the precipitate, it was dissolved in alcohol, and the clear alcoholic solution, containing all the alkaloids of the 10 grains of bark, evaporated to dryness. When the residue of the evaporation had been so long heated on a water bath that its weight remained constant, it was proved that this weight was 1.116 grains. The analyzed bark consequently yielded 11.16 per cent. of alkaloids, which are forwarded with the report.

BARK, No. 2.

47.67 grains of bark dried at 212° Fahrenheit, and analyzed by my method, yielded 1.36 grains of alkaloids, consequently 2.85 per cent., and 0.293 grains of quinovic acid, consequently 0.61 per cent. Of these 1.36 grains of alkaloids, 0.77 were dissolved by ether, so that the bark consequently contains 1.61 per cent. of alkaloids soluble in ether.

The part soluble in ether, when saturated with oxalic acid, yielded beautiful crystallized oxalate of quinine, and left an uncrystallizable mother liquor, from which was obtained the abovementioned amorphous alkaloid. The part insoluble in ether contained no quinidine, but the quantity of 0.59 grains was too small to ascertain with certainty if this part contained either pure chinchonine, or a mixture of this with chinchonidine. During my experiments, I observed that this bark contains a large amount of chlorophyll.

CONCLUSION.

No. 1 bark is the most valuable specimen I ever met, as I never before manipulated a bark yielding the enormous quantity of 11 per cent. of alkaloids.

(signed) J. E. de Vry.

Enclosure 3, in No. 95.

MEMORANDUM.

THE indigenous materia medica of the hill ranges of Southern India is varied and extensive, and comprehends many plants of proved value.

2. The best means of bringing these into general use has often been discussed, and was under the earnest consideration of the Drug Committee (appointed by the Secretary of State for India) when I left London in September 1865.

3. A few of the many officinal plants, both indigenous and naturalized, which abound at or near Ootacamund, may be mentioned.

INDIGENOUS.		NATURALIZED.	
Cannabis indica	- Indian hemp.	Argemone Mexicana	- Oil.
Berberis.		Digitalis purpurea	- Leaves.
Ophelia	} Chiretta, or hill gentian.	Mint	} Essential oils.
Exacuna		Peppermint	
Andrographis paniculata	- Creyat.	Lavender	
Gaultheria	- Winter green oil.	Hyosciamus	} Extracts.
Pterocarpus Marsupium	- Kino.	Taraxacum	
Citrus	- Citric acid.	Belladonna	
		Scammony.	
		Jalap	} Roots.
		Aconite	

4. The Superintendent of the Government Garden at Ootacamund could collect specimens of these and others, for transmission to the medical stores; but the preparation of the oils, extracts, &c., could not devolve upon him, and from the want of a properly qualified pharmacien, there has been little progress made in the employment of hill medicines.

5. On this account, I concur in the proposal to engage a skilled pharmacist, in order that the medicinal plants growing around us may receive due attention, and the officinal preparations be made, in an approved manner, on the spot, from fresh leaves, seeds or roots. In the end, I believe this would prove an economical arrangement.

(signed) H. Cleghorn, M.D.

Coimbatore, 17 January 1866.

Enclosure 4, in No. 85.

MINUTE by the Honourable the President.

1. I HAVE before me Mr. Markham's report of his views on the subject of chinchona cultivation, and a variety of collateral topics connected with this, together with the minutes of the Members of the Government, upon certain propositions contained in a late despatch from the Secretary of State. As these are, to a certain extent, embodied in Mr. Markham's report, I shall deal with them as forming part of the subject which the Government has now to consider.

2. Before, however, I proceed to discuss the various heads of Mr. Markham's report, I may say that it is very satisfactory to hear, from him, so full an expression of approval of the system under which the plantations of chinchona have been cultivated. The success which has attended the experiment is attributable to the ability and zeal exhibited by Mr. McIvor, to whom, from the very commencement, the Government intrusted the whole superintendence and management of the plantations. It is but fair to Mr. McIvor to say, that he has taken a very extended view of the responsibility of his position. He has not only succeeded admirably in rearing and cultivating the plants, but has, by the many experiments which he has made, and is making, added very much to our knowledge of the qualities of the different species, and has also discovered a mode of cultivation by which the quantity of bark, and of the alkaloids which it contains, will probably be largely increased.

3. I think I shall bring the subject more clearly before the Government if I separate altogether the questions connected with the cultivation of the plant, from those which relate to the mode of dealing with the bark after it is removed from the tree; and I will first address myself to the subject of cultivation. In a minute which I submitted some months back, I gave an account of a visit which I had paid to the different plantations, and I, in that, recommended that the Government should cultivate 1,200 acres, and should reserve also certain portions of land in juxtaposition to each plantation, in order that if at any time it is thought fit to sell the plantations, and trust altogether to private enterprise for the supply of bark, these plantations might fetch higher prices in the market when capable of extension, than they would be if put up by themselves.

4. I gather incidentally, from Mr. Markham's report, that he is desirous to see the amount of land, viz., 1,200 acres, brought under cultivation as speedily as possible; but I also gather, from something which he says about the plantation at Mailkoondah, which he wishes to limit to 200 acres, that he does not consider the addition of waste land to each plantation advisable. It would be as well, I think, to let Mr. Markham see all the papers which have any bearing upon the subject of the cultivation of chinchona, in order that he may know all that has been said and written with reference to this, before he commits himself to any positive opinion on this portion of the subject. Mr. Markham's observations and recommendations on the subject of chinchona cultivation are contained in paragraphs 27 to 50. He brings prominently forward the fact, that the object of the Government in introducing chinchona cultivation into India, was, not to show that its culture would prove remunerative, and the prospects such as to encourage private enterprise, but rather to reduce the price of bark as low as possible, and to bring its use within the means of the poorest coolie in the land.

5. I think, however, that in laying so much stress upon the reduction of price, Mr. Markham has overlooked a distinct expression of opinion on the part of the Secretary of State, that it is desirable that such a return on the produce of the bark should be secured as will pay the original outlay and subsequent expenditure on the chinchona undertaking, with good interest. That the ultimate result of the extension of the cultivation of chinchona will be a reduction in the price of the febrifuge extracted from it is very clear; but this result must be produced by a very gradual process. In order to extend cultivation, the prospect of good returns must be held out to the private speculator; he must believe himself able to realize larger profits from chinchona than he can hope to do from either coffee or tea; for, unless he can do this, he will not risk his capital upon what is at present a mere speculation with the Government, of whose action he can but guess, as a competitor. Should the first planters realize large profits, other capitalists will soon be found to claim a share in these, and competition will bring down the price of bark to a minimum, which minimum will be regulated by the profits upon tea and coffee, the antagonists of chinchona, on the hills of India.

6. I cannot, therefore, think that it would be advisable to press Government aid upon those who have already commenced plantations in Travancore, the Pulneys, &c. The best encouragement which we can hold out to them will be, the success of our plantations. If we can show that these do yield a large return upon the capital laid out upon them, there will not be wanting men willing, and, indeed, eager, to enter upon the cultivation of chinchona.

7. With reference to the proposals that the villagers in the hill districts should be induced to include chinchona trees among their products, first for home consumption, and next for supplying bark to the villages and dispensaries on the adjacent plains, I am afraid that no inducement which the Government could reasonably hold out would be productive of the least effect at present. Hereafter, when the value of bark as a product, is well established,

established, natives as well as Europeans, will be quite open to the arguments which are addressed to their pockets, and a gradual extension of cultivation will take place.

8. Mr. Markham proposes that seeds and plants should be given away to all who are desirous of growing them, without any charge. The Government has already reduced the price from four annas to one anna per plant, when more than 5,000 are taken, and it may be as well to make the reduction general, and to charge the same price per plant for any number, however small or however great; but I am not disposed to accede to Mr. Markham's proposal that they should be distributed gratuitously. It must be remembered that these plants have cost the Government a large sum, and the simplest mode of recovering this money is to put a price upon the article. I put more confidence in the saying "a man will take more care of what he has paid for than of what he has got for nothing," than Mr. Markham is inclined to do. Besides, if a man can always get what plants he requires from a Government establishment for the mere cost of conveyance, he will not do what Mr. Markham supposes, that is, go to the expense of making a propagating establishment for himself. While, therefore, I am not disposed to give away plants gratuitously, and thus to make to the cultivator a present of a sum of money equivalent to the price of about 800 plants per acre upon every acre he may choose to cultivate, I am not at all disposed to make extra profits upon these plants, but should willingly lower the price now charged should it be shown to be in any way excessive or unreasonable.

9. I am quite disposed to agree with Mr. Markham as to the advantages to be derived from the application of convict labour to the cultivation of the Government plantations; the difficulty which has prevented the extension of this to Neddiwuttumi and Mailkoondah is one which has sole reference to the maintenance of proper discipline among the men at places so far detached from the head quarters of the magistrate. Attempts are now being made to overcome the difficulty, and I trust that the Government may be able to avail itself of the amount of convict labour at its disposal, so as to accelerate the completion of the different plantations.

10. I have noticed, I think, all the questions relating to the cultivation of the chinchona. I will, now, therefore, deal with those portions of Mr. Markham's report which allude to the mode of dealing with the bark.

11. I may observe, in the first place, that our treatment must be for some time empirical. We must make a variety of experiments, record their results, and finally be led to adopt the system which will produce the greatest quantity of the best description of bark from a given area at the least cost. I say the best description of bark, for I conceive that the interests of the Government as well as those of private individuals are in this identical; as soon as we have ascertained the best species of chinchona, it would be but a waste of money to continue the cultivation of the inferior kinds; it is to the production of a large proportion of the better description of bark that we must look if we wish to drive the inferior kinds of South American bark out of the market, and it is to the production of the best kind of bark that we must look if we wish to reduce the price of the febrifuge. It costs as much to cultivate and maintain a plantation of inferior trees as of the best kinds, the profit to be derived must therefore depend upon the quantity and quality of the produce.

12. Mr. Markham is of opinion that in India it would be desirable to use the rougher extracts of bark, instead of the more expensive sulphate of quinine; and he suggests a preparation which he calls quinium, as being, in the first place, cheaply and easily made, and in the second place effective as a febrifuge.

13. The Secretary of State made a similar recommendation as regards some of the other alkaloids contained in the bark. It would be very easy to add "quinium" to the list of preparations to be submitted for trial, and this had better be done at once, and it would be as well that the preparations should be made with Neilgherry bark, of which there will be an ample quantity when the three acres which I recommended to be treated as coppice are cut.

14. The experiments might be made by the chemical examiner here, but if the Secretary of State thinks it advisable to employ Mr. De Vry, I am inclined to think that the services of that gentleman might be found very useful in a variety of collateral inquiries.

9 February 1866.

W. T. Denison.

Enclosure 5, in No. 85.

MINUTE by the Honourable T. Pycroft.

1. I CONCUR generally in the views expressed by His Excellency the President in his minute on Mr. Markham's report on the Chinchona plantations of the Neilgherries. I will say a few words on each of Mr. Markham's proposals separately:—

First. That a quinologist of established reputation be located for three years at Ootacamund; that he may, in concert with Mr. McIvor, investigate on the spot questions connected with the elaboration of alkaloids, the preparation of the bark, the most economical and efficacious mode of preparing the febrifuge, &c. &c.

It seems to me that such a measure as is here recommended is very desirable. As

pointed out by Mr. Markham and Dr. Cleghorn, the gentleman who might be sent out might be profitably employed not only in studying and elucidating the various questions connected with the chinchona alkaloids, but in developing and turning to account the medicinal plants of the Neilgherries generally.

Secondly. That the Mailkhoondah plantation be restricted to 200 acres, and be used solely for propagating purposes.

As I entertain great doubts whether the Government operations for the raising of chinchona should be extended to Mailkhoondah at all, I should, of course, be in favour of restricting them as much as possible if a Government plantation is to be established there. But the question in regard to the formation of a Government chinchona plantation at Mailkhoondah has been referred to the Secretary of State, and we must await his orders.

Thirdly. That chinchona seeds and plants should be distributed gratuitously to all applicants.

I am quite opposed to this. The plants and seeds should be supplied, without reference to the number taken, at such a price as shall just remunerate Government. Government should not gain by their sale, but there is no reason why they should lose. Plants are now largely applied for at one anna apiece. If that be too high, it may be reduced to what will just cover the cost of rearing.

Fourthly. That efforts be made in a variety of ways to induce the natives to plant chinchona.

There can be no objection to this, but it is a measure which cannot be forced. The natives, it is to be hoped, will be brought gradually to feel the advantage of cultivating chinchona. But I fear it is not quite so simple an affair, nor one of such easy accomplishment as supposed by Mr. Markham.

Fifthly. That a person selected by Mr. Levinge, Collector of Madura, be sent at the Government expense to Ootacamund, there to receive instruction in the cultivation of chinchona, which he is afterwards to carry out on the Pulneys.

I am not in favour of this; the operations of Government in the cultivation of the chinchona should, in my opinion, be confined to the Neilgherries. There is no fear that the cultivation will not, in private hands, extend to all the hill ranges, nor is it at all necessary to interfere with its ordinary development.

Sixthly. That convicts be at once sent to the Neddiwuttum gaol.

When Government are satisfied that convicts can be securely guarded and well cared for at Neddiwuttum, and that convict labour will be as economical there as free, they may be sent. But these questions are now under investigation.

14 February 1866.

T. Pycroft.

Enclosure 6, in No. 85.

ORDER of the Madras Government.

1. ORDERED that the Principal Inspector General, Medical Department, be requested, with reference to paragraph 3 of the despatch of the Secretary of State, above recorded, to submit a list of the medical officers, whom, having regard to the qualifications mentioned in the despatch, he would recommend for appointment to the proposed commission. Dr. Shaw will also make such suggestions as occur to him, for ensuring a decisive trial of the relative and positive qualities, as febrifuges, of the Chinchona alkaloids other than quinine, specified in the despatch, and of the preparations, quinium, &c. alluded to by Mr. Markham.

2. The promised supply of alkaloids has not yet been received.

3. The Principal Inspector General, Medical Department, will be furnished with a copy of paragraphs 14 to 22 of Mr. Markham's Report, and of G. O., 20th ultimo, Revenue Department, No. 460.

4. With reference to paragraph 32 of Mr. Markham's Report, the Government consider it desirable that one uniform price should be charged for plants, whatever number may be taken. Under the present arrangement, a planter requiring say, 3,000 plants, gains by purchasing 5,000, and throwing away the surplus 2,000. Mr. McIvor will, therefore in future, charge one anna per plant in all cases. The Government do not concur with Mr. Markham as to the gratuitous distribution of seeds and plants, but wish to have Mr. McIvor's opinion on the subject. In submitting this, Mr. McIvor will state how many applications he has still on his registers, how he deals with applications (whether by priority of date, extent of requirement, or on what other principle), and how many of the 900,000 plants in his possession are in a fit state to send out to private applicants, possessing only ordinary skill and experience in horticulture. The Government consider that there is much truth in the remarks contained in the 58th paragraph of Mr. McIvor's last annual report, and apprehend that any such general distribution of delicate plants as Mr. Markham proposes would be unsuccessful. They wish to know when Mr. McIvor will be in a position to furnish well-grown plants in any considerable number.

5. The

5. The collectors of the districts marginally noted will offer such suggestions as occur to them on paragraphs 35 to 40 of Mr. Markham's report.
6. The deputy collector of Wynaad will be furnished with a copy of Mr. Howard's work on the Chinchona, and application will be made to the Secretary of State for a few more copies of the work. Copies of the Chinchona manual, with the annual additions thereto, have been extensively circulated, and Mr. Richardson doubtless has these; if he has not, copies will be sent to him.
7. Ordered, that a copy of Mr. Markham's reports be sent to the Government of Bombay, the Resident of Travancore and Cochin, the Commissioner for the territories of his Highness the Rajah of Mysore, and the Chief Commissioner Central Provinces, with the remark that the Governor in Council will be glad to afford them any assistance that may be desired in extending Chinchona culture.

Ganjam
Vizagapatam.
Bellary.
Kurnool.
Canara.

Malabar.
Coimbatore.
Salem.
Madura.
Tinnevely.

8. The proceedings will be reported to the Secretary of State.

(signed) *J. D. Sim,*
Secretary to Government.

Enclosure 7, in No. 85.

From *W. G. McIvor, Esq.,* Superintendent Government Chinchona Plantations, to
A. J. Arbuthnot, Esq., Chief Secretary to Government, Madras.

Sir,

Ootacamund, 8 July 1864.

1. I HAVE the honour to request you will be good enough to submit, for the consideration of Government, that for some time past great difficulty has been experienced in obtaining sufficient labour to perform the works connected with the Chinchona plantations, and as this difficulty is still increasing, I would respectfully solicit the favour of being furnished with about 500 prisoners, to be located on our plantations, making the principal station at Neddiwattum. Here it would be necessary to build a temporary prison, a plan and estimate of which will be submitted after consultation with the inspector of prisons.
2. I understand that Chinese convicts can be procured from the Straits Settlements; these perhaps would be better suited to work in this climate than natives from the plains, and being generally good and careful cultivators, they will probably prove more useful.
3. Not only is the scarcity of labour severely felt and the cost enhanced, but the labourers now refuse to perform their ordinary tasks, and thus unless by the assistance of the prisoners, it will, I fear, be impossible to perform the operations of the present year within the estimated cost.
4. The Dodabetta plantations being situated within two miles at the farthest point from the native gaol of Ootacamund, here accommodation might be afforded for 100 prisoners appointed to work on these plantations.

From *J. Rohde, Esq.,* Inspector General of Gaols, to *A. J. Arbuthnot, Esq.,* Chief Secretary to Government.

Sir,

Ootacamund, 14 July 1864.

1. IN acknowledging your memorandum of the 9th July 1864, on Mr. McIvor's letter of the 8th idem., therein enclosed and now returned, I have the honour to state that I consider that officer's suggestion, as more fully detailed in his letter of the 12th instant, and memorandum therein enclosed, unobjectionable. I should be disposed to relax discipline in the case of prisoners so employed; but, if the full establishment of guards is to be maintained, I think it probable that the arrangements with the police may be a hindrance. As far as the Prisons Department is concerned there is no difficulty.
2. Mr. McIvor will provide suitable accommodation, his plans for which meet my approval.
3. I have said convicts from the gaol cannot conveniently work at the Dodabetta plantation; on this point Mr. McIvor is satisfied.
4. Mr. McIvor spoke to me about the Chinese convicts; I have already stated myself favourable to their employment in Government plantations (see proceedings of Government, 3d September last), and see no reason to change my views.

ORDER of the Madras Government, 3rd August 1864.

1. THE Governor in Council is of opinion that, with reference to the great scarcity of free labour on the Neilgherry Hills, the labour of convicts may with much advantage be made use of on the Chinchona plantations now in progress.
2. Mr. McIvor will submit, through the Inspector General of gaols, plans and estimates of the prisons he proposes to erect, providing accommodation for 500 persons to be employed

ployed on the plantations at Pycara, Neddiwuttum and Melkoondah. Mr. Rohde, when forwarding these plans, will state definitely and in detail the arrangements he would suggest for guarding the prisoners, maintaining discipline, &c.

(True Extract.)

(signed) *J. D. Sim,*
Secretary to Government.

To the Superintendent Government Chinchona Plantations,
To the Inspector General of Gaols.

From the Inspector General of Gaols, to the Chief Secretary to Government, Fort Saint George; Ootacamund, 11 November 1865.

I HAVE the honour to state, for your information and that of His Excellency the Governor in Council, that, on visiting the gaol on the Dodabetta Plantation, Mr. McIvor informed me that the Neddiwuttum Plantation Gaol would shortly be ready for its prisoners. I rode out with him, and inspected the building, which, though substantially nearly ready, was not in so forward a state of completeness as I supposed. I particularly requested Mr. McIvor to take measures to hasten the work, and get the building ready by the end of the month, as I should not like to move prisoners in the southern districts after the 20th or 25th of December, when cholera generally prevails.

2. I shall limit the gang in accordance with the Orders of Government, 5th September 1865, proportioning the numbers to the size of the building, at the ratio laid down for the Dodabetta Gaol, which it is like, though about treble the size.

3. Before I make arrangements for the transfer of prisoners to this and other plantation gaols, I must beg the Government to reconsider the whole question of the charge of the gangs, and that of the individual in whom the power of punishment, under Regulation X. of 1832, should be vested.

4. In my first letter, 13th August 1864, I suggested that powers of punishment of prisoners in the Dodabetta Plantation should, under Regulation X. of 1832, be vested in the ordinary course in the joint magistrate of Ootacamund; the question of superintendence I did not then enter on.

5. In my letter of the 19th May of the present year, I suggested that Mr. McIvor should have charge of the gang, with such special powers of punishment as, under the provisions of Regulation I. of 1833, the Government might confer on him; all offences which should not be summarily dealt with under those powers being exercised by the joint magistrate. The Government decided on vesting the powers of punishment under Regulation X. of 1832 in the joint magistrate, making no order in regard to charge and minor punishments.

6. Major Campbell met me previous to my seeing Mr. McIvor, and both urged that the power of punishment, with such limitation as to the Government should seem fit, should be vested in the officer in charge. Practical inconvenience and some irregularity has resulted from the present arrangement; and I think, with Major Campbell, that it is an objection that the prisoner is led to consider himself as a person of consequence when so much trouble has to be taken to ensure punishment for every misdemeanor on his part.

7. I have said irregularity has arisen under the present rule, alluding to written reports of the offences of prisoners signed by the gaoler being received in evidence. On viewing these reports of the gaoler, I found that they included a recommendation of the measure of punishment to be awarded. I desired that the evidence should in all cases be forwarded with the accused prisoner; but I mentioned to Mr. McIvor that I should suggest a change in the system, and this more especially as the Neddiwuttum prisoners could not in case of misconduct be sent in, and the distance to the Dodabetta Gaol and the inconvenience resulting from sending in prisoners for trial are greater than I anticipated even at the date of my letter of the 19th May 1865.

8. I would now suggest that Mr. McIvor be entrusted with powers of punishment under the provisions of Regulation I of 1833, as already suggested in my letter of the 19th May. I think Mr. McIvor is himself convinced that it would be sufficient that these powers need not be to the full extent provided by Regulation X. of 1832, and that it is the certainty and immediateness of punishment, and not its severity, that ensures respect. I would, therefore, suggest that he be authorised to punish to the extent of 40 lashes; any prisoners habitually subjecting themselves to severer punishment I should remove.

9. I do not consider it necessary to refer to the correspondence on this point; I enclose it in case you care to look into it, but it involves no point which I have not adverted to.

10. I found that the side rooms of the gaol were not occupied, under an idea that they were not secure, I have therefore not allowed for them in calculating the contents of the Neddiwuttum gaol, each room of which measures $72 \times 32 \times \frac{16 \times 23}{2} = 42524$ feet, or

83,048 feet in all, which divided by 564, the rate arbitrarily assumed in the Government Order (1241), gives accommodation for, say, 147 prisoners. My own opinion is that 200 might with equal safety be confined in the building, and the chances are that they would even then have, each, one-third more air than they had in the gaols from which they are transferred.

From the Superintendent of Government Chinchona Plantations, Ootacamund, to the Inspector General of Gaols; dated Ootacamund, 3 November 1865.

WITH reference to the Order of Government of the 21st October 1865, No. 1500, I have the honour to solicit the favour of your bringing to the notice of Government that serious inconvenience is likely to arise in consequence of my not being invested by Government, under Regulation I. of 1833, with the powers of punishment of prisoners under Regulation X. of 1832.

2. By the enclosed correspondence, you will observe that the joint magistrate of this station has directed that such prisoners as fail to perform their task be forwarded to his court for trial, together with the necessary witnesses to establish the charge. The Ootacamund Court being nearly $4\frac{1}{2}$ miles distant by the road, would involve the loss of the entire day's work of the convict, together with that of the witnesses, on every occasion on which it was necessary to inquire into the misbehaviour of any one convict. One police guard at present is barely sufficient to guard the men at work, and could not be spared to form this escort; while the prisoners, being aware that no one on the spot has any power over them, may produce serious outbreak.

3. I trust, therefore, that you may be pleased to move Government to confer on me the necessary powers of punishment over the prisoners confined in the Dodabetta, Neddiwuttum, and Maikhondah Gaols.

4. I would also, with your approval, solicit permission to reward prisoners who performed work over and above the allotted task, to the full value of the extra work performed, either by giving to the prisoner an extra allowance of food, or money to be deposited on his account, and made over to him on his release, or that the extra work may be taken in reduction of his sentence, as he may select. This would place me in a position to offer a very great encouragement to the convicts, and might prove the means of teaching them the benefits and advantages to be derived from constant and diligent labour.

From the Joint Magistrate, Ootacamund, to the Superintendent Government Chinchona Plantations, in charge of Gaol, Dodabetta; dated Ooty, 31 October 1865, No. 124.

I HAD some conversation with Mr. Rohde to-day about the punishment of convicts in your gaol.

2. Mr. Rohde says it is absolutely necessary that convicts who misbehave appear at my Court, and that I should summarily investigate their cases. I beg, therefore, when occasion requires, you will be so good as to forward the individuals to my Court, with witnesses, as also your book, with particulars of the misbehaviour of the convicts, duly signed by you, as superintendent, when I shall be able to satisfy myself, and record any punishment that I may award in the book.

From the Superintendent, Government Chinchona Plantations, to the Joint Magistrate, Ootacamund; dated Ootacamund, 3 November 1865.

IN acknowledging your letter, No. 124, dated 31st ultimo, I have the honour to inform you that I am unable to find any Government Order placing me in charge of the Dodabetta Gaol or the convicts. It appears to have been an error my taking charge of the prisoners, except so far as regards working them, as without the power of enforcing obedience, it would be vain my endeavouring to maintain gaol discipline.

2. From the correspondence, it appears that the entire control of this prison is under you as joint magistrate; consequently, I have directed the gaoler in future, to apply to you for instructions in all matters connected with this prison.

3. The object in suggesting the construction of gaols on the Chinchona plantations was to provide a supply of labour at command at all seasons, and at a reasonable cost. To forward such convicts as failed to perform their task would, I fear, negative the results sought to be obtained, inasmuch as to get redress for the non-fulfilment of the daily task would render necessary the loss for an entire day's work, in attending and returning from your Court, of the convict or convicts accused, and of the necessary witnesses; while, in addition to this loss, my department would also have to bear the expense of the extra police guard necessary for this duty. I therefore hope that, under these circumstances (pending a reference to Government), you may be able to make it convenient to visit the gaol, and punish delinquents on the spot.

(True Copies).

(signed) *W. G. McIvor*,
Superintendent, Government Chinchona Plantations.

From the Superintendent of the Government Chinchona Plantations, Ootacamund, to the Chief Secretary to Government, Fort Saint George; Ootacamund, 16 November 1865.

I HAVE the honour to solicit the favour of your being so good as to bring to the notice of Government that serious inconvenience is experienced in working the convicts employed on the Dodabetta Chinchona plantation, in consequence of the prisoners having recently ascertained that there is no one on the spot with power to punish them.

2. On Monday the 13th instant, the whole of the convicts, with the exception of the Chinese, refused to perform their work, were highly insubordinate, and insulting to the overseer in charge of the gang. On Tuesday the 14th, this spirit became still more apparent; and on the 15th, we arranged to march the whole of the native prisoners to the court of the joint magistrate; but on applying to the police inspector for a sufficient guard for this purpose, it could not be supplied. Under these circumstances, the magistrate kindly visited the Dodabetta Gaol, and punished the less serious of the offenders on the spot, amounting to 56 in number, while 11 of the prisoners have been forwarded to the magistrate's court to-day, to be tried for more serious offences, such as criminal intimidation, &c.

3. The prisoners have hitherto been cheerful and contented, and willingly performed their work, but a few bad men having instigated the others, they combined to throw off all control. In attempting to send a few of the first offenders into the station, they immediately feigned sick and would not walk, but lay down on the road, one here and another there, so that the men who were walking on, and who had laid down, could not be guarded by the police.

* Court, Ooty, 4th November 1865.
"I return the letter sent, I fancy, for my frank, as I am not authorised to frank or in charge of Dodabetta Gaol, and I beg to inform you that, as it is quite impossible for me, in my position as magistrate, to visit your gaol as you request, I have forwarded your letter, No. 94, of 3rd November 1865, to Mr. Rohde."

4. On the 3rd instant, I had the honour to bring to the notice of the Inspector General of Gaols the inconvenience likely to arise in consequence of my not being invested, under Regulation I. of 1833, with the powers of punishment of prisoners under Regulation X. of 1832, and as the joint magistrate of this station states* it to be impossible for him to visit this gaol, or to take charge of it, I trust the Government may, therefore, be pleased to issue early orders on the subject of my letter above noted.

5. The subject of this letter I have communicated personally to Mr. Rohde, and understand from that gentleman that he has recommended me to have charge of the gaols on the Chinchona plantations, and be entrusted with some limited powers of punishment of prisoners, but that these powers should not amount to those in Regulation X. of 1832.

6. Should the Government consider it advisable to give me any charge of the prisoners, except in so far as working them, I respectfully submit that with this charge the full powers of punishment be conferred, as without such, any attempt to work the prisoners successfully on our plantations must, I fear, end in failure.

No. 23. From the Inspector General of Gaols, to the Chief Secretary to Government, Fort St. George; dated Ootacamund, 18 November 1865, No. 517.

IN acknowledging the Order of Government of the 8th instant, No. 1589, relative to the arrangements for controlling the prisoners on the Chinchona plantations, I have the honour to state that my letter of the 11th idem will have anticipated the question. I am of opinion that, all things considered, it will be best to confer on Mr. McIvor the powers of punishment enacted by Regulation X. of 1832, as provided by Regulation I. of 1833. It will be for the Government to decide on the extent to which such powers shall be conferred. I do not anticipate any abuse, should full powers be conferred; but, should there be any objection to this, I consider that by limiting the extent of punishment to 36 stripes, there will be ample power; indeed, I do not generally consider that stripes in excess of 36 or 40 are so beneficial as the nominally milder punishment.

No. 24. ORDER thereon, 4 December 1865, No. 1724.

UNDER the provisions of Regulation I. of 1833, the Governor in Council directs that the Superintendent of the Government Chinchona plantations, in his capacity of superintendent of the gaol at Dodabetta, shall exercise the powers of punishment created by Regulation X. of 1832. The Inspector General will report to Government, at the expiration of six months, the number and nature of the punishments inflicted by Mr. McIvor, with such remarks, if any, as he may have to make upon the subject.

2. The Governor in Council does not deem it necessary to pass any orders with reference to the gaols which it is proposed to establish at Neddiwuttum and Maillkoondah, as those gaols are not yet completed. The Inspector General will apply to Government for sanction before taking any steps with reference to the transfer of prisoners to either of those gaols.

(True Extract.)

Chief Secretary.

To the Inspector General of Gaols.

From the Inspector General of Gaols, to the Chief Secretary to Government, Fort St. George; Ootacamund, 11 December 1865.

IN reference to the Order of Government, No. 1724, dated 4th instant, I have the honour to report that the Neddiwuttum Gaol building is now reported complete.

2. I must solicit early orders in regard to the transfer of the convicts, as I really do not know how to dispose of many in the southern gaols, and I am most anxious to move any gangs in the south before the usual season of epidemic disease.

ORDER of the Madras Government, 19 December 1865.

THE Governor in Council is not prepared to sanction the transfer of any prisoners to the Chinchona plantation at Neddiwuttum, until the experiment of employing convicts on the Dodabettah plantation has been fully tested.

2. The Inspector General will abstain from taking any steps in the matter until further orders.

From the Superintendent of the Government Chinchona Plantations, Ootacamund, to the Secretary to Government, Revenue Department, Fort Saint George; Ootacamund, 5 January 1866.

WITH reference to the Order of Government in the Judicial Department, dated 19th December 1865, No. 1813, I would most respectfully submit, for the consideration of Government, that, deferring the transfer of convicts to the Neddiwuttum Gaol, which is now completed and ready for their reception, will seriously retard the progress of this plantation.

2. The Government having approved* of the employment of convict labour on this plantation, and authorised the construction of a gaol for the reception of the prisoners, in order to complete this building, and secure to the plantation the advantages of the convict labour as speedily as possible, I employed many of the labourers, which might have been (and would, had no gaol been in course of erection) employed in preparing ground to enable us to plant out our nursery plants in the spring. Early in January, many of our free labourers will be leaving for their homes, upwards of 200 having already given notice to that effect, and those men will not return until the end of May or beginning of June, being in fact too late to prepare land for next planting season, I having depended on getting this work done by the convict labour during the months of January, February, and March; and if disappointed in this, it will form a very serious impediment to getting our nursery plants put out this season, while they will be too large to transplant the following season.

* G. O. dated 3 Aug. 1864, No. 1338.

3. With reference to the success which will attend the performance of heavy work on our plantations by convicts, there can, I submit, be no doubt, as what has already been done at Dodabettah fully establishes this; and I have no hesitation in saying that all future experience will establish that convicts can be employed on these plantations with advantage to the Government, and with satisfaction and benefit to themselves.

4. I have, for the last 25 years, been accustomed to the management and arrangement of labour, to the settlement of disputes arising among those employed under me, and so successful have I been in these matters as to procure a fair proportion of work, and to command labourers when others were unable to do so, thus establishing my arrangements to be satisfactory to the parties employed; and should any report contrary to this have reached the Government, I would esteem it a favour by being furnished with information respecting it, as I feel confident your Honourable Government will not allow any report, until fully investigated, to impede the progress of this national undertaking.

5. It is true that misconceptions arose among the prisoners when first located in the Dodabettah Gaol; but for this, I am in no way responsible, as I then had no control or influence over them. The prisoners thought that they could throw off all control with impunity, and dictate their own terms. In this they were instigated by prisoners (13), who were removed for doing so to the Lawrence Asylum Works, but prior to their removal were sentenced by the magistrate, Major Campbell, to 60 lashes each; but this punishment was not inflicted, being remitted on the recommendation of the officer in charge of the asylum gaol. This may have had a bad effect on our prisoners, by leading them to conceive that by giving trouble they could be removed, and evade punishment for any misconduct in this gaol.

6. With prisoners, it is natural to suppose, that there will be some trouble in managing them, and, occasionally, hardened offenders must be punished, although generally the certainty of immediate punishment prevents its infliction; however, all that has taken place in the Dodabettah Gaol is unimportant, when compared with the disturbances and escapes at the Kaundle and Lawrence Asylum Gaols. Now that the prisoners on the

Dodbettah plantation are accustomed to their work, they are contented, cheerful, and perform, on an average, quarter to half more than their daily task, for which they receive extra indulgences.

7. The police guard are afraid of the Chinese prisoners, and misconceptions arise because they do not understand their language, and as we have at present a large number of Chinese in proportion to the native convicts, intending to train one-half of the Chinese at Dodabettah, and remove them to the Neddiwuttum gaol immediately it was completed.

8. Under the circumstances above noticed, I beg most respectfully to solicit the favour of Government being pleased to reconsider their order, as it would be conferring a great benefit, not only to the plantations, but evidently to the Inspector General of Gaols, to allow the transfer of convicts to Neddiwuttum, inasmuch as that officer has so many in the southern prisons that he does not know how to dispose of them.

ORDER of the Madras Government, 20 January 1866.

BEFORE passing final orders on the foregoing letter, the Governor in Council directs that the Inspector General of Gaols will submit to Government, with as little delay as possible, a detailed estimate of all the additional charges which will have to be incurred in guarding, feeding, and clothing, and for medical attendance to the prisoners whom it is proposed to locate in the gaol which has been erected on the chinchona plantation at Neddiwuttum. The Estimate should be prepared in communication with Captain Drever, the Deputy Inspector General of Police for the division, the Inspector General of Police being at present at too great a distance to be communicated with, without considerable delay, and with the medical officer in charge of the Lawrence Asylum gangs. It should include the salary of a competent European superintendent, to be employed exclusively on this particular duty, and of a medical subordinate. All extra charges entailed by the location of the prisoners at Neddiwuttum will have to be met from the Chinchona Estimate.

From the Inspector General of Gaols to the Chief Secretary to Government, Fort Saint George; Ootacamund, 29 January 1866.

IN reference to the Order of Government, 20th January 1866, No. 86, relative to the employment of convicts on the Neddiwuttum plantations, and to the direction that a superintendent, to be employed exclusively on this work, be charged in the Estimate, I have the honour to state that this condition, if taken literally, seems to me a bar to the adoption of the plan, as I could hardly expect any superintendent, with the necessary qualifications, and wholly confined to the duty, to serve for a moderate salary.

2. I think that by an arrangement I have suggested to Mr. McIvor, and to which he assents, the difficulty may be overcome, namely, by removing Mr. Charles Dawson to Neddiwuttum as Mr. McIvor's assistant, both in regard to the plantation and convicts, and giving him powers, under Rule 1 of 1832, in Mr. McIvor's absence.

3. I have seen Captain Drever, and await his estimates. Dr. Miller has been engaged day and night in some bad cases, and I have hitherto missed seeing him.

4. All I now wish to know, is, whether the Government would, in reference to what I have suggested, insist on a superintendent wholly employed on the duty being provided?

P.S.—I have since seen Dr. Miller. He thinks my proposal that Mr. Beckett, now at Vellore, should be offered the medical charge, a good one. He has confidence in Mr. Beckett, and I could entrust him with the duties of gaoler also. Under any circumstances, Dr. Miller thinks it necessary that an apothecary, and not a dresser, should be in charge, instancing the failure at Lovedale till the dresser was superseded. He thinks a staff allowance of, say, 50 rupees, should be given for the duty. Dr. Miller will, if possible, accompany me to the gaol at Neddiwuttum, this week or early next week.

ORDER of the Madras Government, 6 February 1866.

THE Governor in Council desires that the Inspector General of Gaols will state explicitly whether he considers Mr. Dawson to be a fit person for the superintendence of convicts. Mr. Dawson's age should be stated.

2. Mr. Rohde should submit the rest of the information called for in the Proceedings of Government of the 20th ultimo, with as little delay as possible.

To the Inspector General of Gaols.

(signed) *A. J. Arbuthnot,*
Chief Secretary.

MINUTE by the Honourable the President.

A PROPOSITION was made by Mr. Rohde, I think, to give the charge of the prisoners at Neddiwuttum to Mr. Dawson, and I have since heard from Mr. McIvor that he is disposed to place Mr. Dawson in charge of the plantation at Neddiwuttum, as Captain Nicholls is not qualified to have charge.

2. This would remove the difficulty about the charge of the convicts, as Mr. Dawson might have powers given to him similar to those now conferred on Mr. McIvor as regards the Dodabetta convicts. Mr. Dawson might have 50 rupees extra per month as superintendent of the gaol, or whatever his designation would be. This arrangement would, I think, suit all parties; the Government would get its gaols emptied, and its Chinchona plantations cultivated, at small cost, by labour upon which dependence could be placed.

3. Mr. McIvor would get his labour cheap, and would only have to pay 50 rupees per month, instead of 500, for superintendence. It would be as well to press the matter forward, as the season is advancing, and the trees are to be barked next month.

(signed) *W. T. Denison.*

MINUTE by the Honourable *T. Pycroft.*

WE must get Mr. Rohde's reply to the reference made to him, not only regarding Mr. Dawson, but on the other points connected with the proposed employment of convicts at Neddiwuttum.

(signed) *T. Pycroft.*

MINUTE by the Honourable *H. D. Phillips.*

I WOULD wait for Mr. Rohde's reply to the several points arising out of the proposed transfer to Neddiwuttum. The cost of the police guard will be rather a large item in the monthly bill.

(signed) *H. D. Phillips.*

From the Superintendent, Government Chinchona Plantations, Ootacamund, to the Secretary to Government, Revenue Department, Fort Saint George; dated Madras, 19 February 1866.

I HAVE the honour to inform you, of my intention to return to Ootacamund on the 21st instant, when I shall place Mr. Charles Dawson in charge of the Chinchona plantation at Neddiwuttum, as I consider him well qualified to take charge of the convicts when employed on this plantation.

2. Mr. Dawson has now been employed on the plantation for upwards of two years, and has shown considerable judgment in the management of his labourers, and I feel confident that, under my direction, his management of the prisoners will prove satisfactory to the Government.

ORDER of the Madras Government, 20 February 1866.

THE appointment of Mr. Dawson to the charge of the Neddiwuttum plantation is approved.

(signed) *J. D. Sim, Secretary to Government.*

From the Inspector General of Gaols to the Chief Secretary to Government, Fort Saint George; Ootacamund, 10 February 1866.

I HAVE the honour, in reference to the Order of Government of the 6th instant, to state, that had I not considered Mr. Dawson qualified for the charge of convicts in the Neddiwuttum Gaol, I should not have recommended him; that Mr. Charles Dawson is, Mr. McIvor states, 25 years of age, and that I consider him qualified.

2. I think he will require Mr. McIvor's assistance in regard to supplies, &c.; as, stationed as he would be at Neddiwuttum, he could not make the arrangements conveniently.

3. As Mr. McIvor is the person most interested on behalf of the Government, I think the arrangement I proposed the proper one.

4. Captain Drever has been prevented from going out to see the gaol and locality; but my last note from him mentioned that he was going yesterday. On receipt of his reply, I will submit full particulars of cost, &c.

ORDER of the Madras Government, 21 February 1866.

LIEUTENANT Colonel Wilson having been appointed Inspector General of Gaols, the Governor in Council directs that he will proceed to Ootacamund, with as little delay as possible, and arrange, in communication with Captain Drever, Mr. McIvor, and Dr. Miller, for the immediate transfer to the gaol at Neddiwuttum of such number of convicts as can be accommodated in it, should he find that the arrangement can be carried out at a comparatively moderate cost. It is observed that Mr. Dawson is considered by Mr. Rohde to be duly qualified for the superintendence of convicts. Lieutenant Colonel Wilson will report the arrangements made, their cost, &c.

To the Revenue Department.

To Lieut. Colonel W. J. Wilson, Inspector General of Gaols.

From the Inspector General of Gaols, to the Chief Secretary to Government, Fort Saint George; Ootacamund, 20 February 1866.

I HAVE now the honour to forward Captain Drever's Report on the requirements for the police at the gaol at Neddiwuttum.

2. From Captain Drever's statement it would appear that 491 rupees monthly would be the expense of guarding the 160 convicts, while taking the bills from the low country police stations 238 rupees would be the charge if the prisoners remained at the district gaols; this latter amount, however, does not include the pay of a European inspector (115 rupees).

3. In Mr. McIvor's absence, I cannot authoritatively state the difference in cost of diet at Neddiwuttum as contrasted with the cost at the gaols from which the prisoners would be drawn; but assuming that the prices demanded from Major Farewell were correct and incapable of reduction, the contract price would amount to 3 annas a head a day, or, for 160 prisoners, 30 rupees daily, or 900 to 930 rupees monthly, or Rs. 5. 10. 0. per man per month; while on the present dietary at Salem, Rs. 3. 7. 11. is the average monthly cost per head; and at Coimbatore the contract price already is the same as I anticipate at Neddiwuttum. In clothing and bedding the hill rate would exceed that of the plains according to the price of cumblies on data in my office; I should assume this difference at 11 rupees per head per mensem.

4. I do not anticipate any serious increase in other items of consumption; firewood, which is paid for in other gaols, will be here furnished free of cost.

5. In regard to the prison's establishment, I cannot assume any rate for the salary of an officer specially in charge, nor do I think this outlay will, under the arrangement I have proposed, be necessary.

6. Assuming that the duties of gaoler and medical attendant may be combined in one individual, I should propose 100 rupees monthly as the staff salary for the double duty.

7. The establishment other than superintendent would consist of nine warders, including one head warder; their pay would amount to 94 rupees per mensem, and I suppose 7 rupees each per annum for warm clothing.

8. Buildings to be erected would, I presume, be available for garden purposes, and the cost would be borne wholly by the gardens.

9. The account then, exclusive of buildings, would stand thus—

Annually.	Actual Cost at Coimbatore.	Probable Cost at Neddiwuttum.
	Rs. a. p.	Rs. a. p.
Full diet for one prisoner, at 3 annas per day	68 7 -	68 7 -
Clothing	4 3 3	11 - -
Lighting stands included in the cost of diet	- - -	- - -
Transfer, including batta on release, to and fro, say 5 rupees, distributed over two years	- 8 -	2 8 -
Superintendence and medical attendance	- - -	1,200 - -
Establishment of one head warder at 14 rupees, and eight warders at 10 rupees each per mensem	- - -	1,128 - -
*Police guards, including European superintendence	†238 - -	491 - -

* I omit this, as I do not know if Government think a European inspector necessary.

(signed)

J. R. [Signature]

† This does not include the pay of a European inspector.

From the Deputy Inspector General of Police, Western Range, to the Inspector General of Gaols, Ootacamund; dated Ootacamund, 12 February 1866, No. 21.

WITH reference to G. O., No. 86 of 20th January 1866, I have the honour to inform you that I visited the proposed gaol at Neddiwuttum on the 10th instant.

2. I find four ranges of huts, sub-divided into four rooms (8' x 7'), have been run up for the accommodation of the police, each room to contain two men.

3. Five more ranges will be required, viz., three similar to those already constructed, and two, sub-divided into two rooms each, for petty officers.

4. I cannot put two men into places of this kind even as a temporary arrangement, and if this gaol is to be permanent, very superior accommodation, even to what I have proposed, must be provided for the guards, as well as their inspector.

5. If 160 convicts are sent to this gaol, the guard will be as follows:

1 European Inspector	-	-	Rupees 115 monthly.
2 Head Constables,	at 27	"	54 "
2 Deputy Constables,	at 16.8	"	33 "
9 1st Class Constables,	at 11	"	99 "
19 2nd Class Constables,	at 10	"	190 "

or, a total of 33 police officers, at a monthly cost of 491 rupees.

6. I failed to see that there was any safe or convenient accommodation ready for the convicts to cook in. I merely mention this lest it may have escaped your notice.

ORDER of the Madras Government, 24 February 1866.

It is observed that Lieutenant Colonel Wilson has been instructed in the Order of Government of the 21st instant, No. 249, to arrange for the immediate transfer to the gaol at Neddiwuttum of such number of convicts as can be accommodated in it, should he find that the arrangement can be carried out at a comparatively moderate cost.

Chief Secretary.

To the Inspector General of Gaols.
 " " " of Police.
 " Revenue Department.

— No. 86. —

From the Secretary of State for India to the Governor of Madras in Council.

My Lord,

India Office, June 1866.

Para. 1. I HAVE considered in Council the letters in the Revenue Department, noted in the margin,* forwarding various reports and proceedings relating to the progress of chinchona cultivation in your Presidency, together with the letter dated 13th March (No. 6) 1866, submitting your proceedings consequent on Sir C. Wood's despatch of the 30th September (No. 27) 1865, and on the report furnished by Mr. Markham after his visit to the chinchona plantations at the commencement of the present year.

* No. 55,	dated 24 August 1865.
No. 59	" 23 Sept. "
No. 65	" 26 Oct. "
No. 69	" 13 Nov. "
No. 70	" 27 Nov. "
No. 74	" 25 Dec. "
No. 75	" 25 Dec. "
No. 4	" 6 Feb. 1866.
No. 5	" 10 March "
No. 13	" 11 April "
No. 16	" 24 April "

2. It is highly gratifying to me to find that the favourable reports from time to time submitted by Mr. McIvor as to the progress of the plantations are fully confirmed by Mr. Markham, and I gladly recognise the skill and energy on the part of Mr. McIvor which have conduced so materially to this result.

3. With regard to the future management of the Government plantations, and the extension of chinchona cultivation throughout the hill districts of your Presidency, I concur in the opinion of your Government as to the manner in which you propose to deal with the plantations of Neddiwuttum, Pykarah, and Dodabet. As regards the Mailkoondah plantation, as to the maintenance of which you solicit my instructions, I am of opinion that operations should, at least for the present, be continued there on the part of Government. The site is reported by Mr. Markham to be peculiarly well suited for the cultivation of the chinchona. If it should be decided eventually to dispose of it, there can be little doubt that any expenditure which may be incurred on it will be

reimbursed; and, although it may be hoped that private enterprise may hereafter render the continuance of operations by Government on an extended scale unnecessary, it is impossible at present to regard as settled the question as to the extent to which Government may see fit to take part in the undertaking. The amount of land specified in para. 5 of your letter should therefore be retained for the present at Mailkondah, the remainder being sold as proposed by you.

4. In order, however, to carry out as fully as possible the great object contemplated by Her Majesty's Government in introducing the chinchona into India, viz., that of making its produce accessible to the greatest possible number of the poorer inhabitants of the country, it is evident that every effort should be made to promote the cultivation of the tree by private persons in all the localities where the cultivation is likely to be successful. It is gratifying to observe the readiness with which planters, both European and native, are disposed to undertake the growth of the chinchona plant, in many cases in connection with coffee plantations; but I am of opinion that the greatest benefit would result, and that one of the most effectual methods of diffusing among the bulk of the community the benefits which the introduction of the chinchona is calculated to produce, would be secured should it be found practicable to promote the cultivation of the tree by villagers and small holders of land in suitable situations, even if they should not be able to do more than plant a few trees around their houses. The agency of the officers of Government of different ranks, who would make known the uses of the bark, and through whom the young plants might be distributed, would, of course be indispensable to the carrying out of this plan; and I am of opinion that every encouragement should be given to those officers who, like Mr. Levinge and Mr. Ballard, show an interest in the matter, and a desire to assist in spreading the cultivation.

5. I agree with your Government that it is not expedient that Government should undertake the maintenance of any plantations in addition to those which it has already established, and I further agree in your decision that in all cases where the cultivation of the chinchona is undertaken for the purposes of trade or profit, a charge should be made for the plants set up from the Government plantations; but in all cases, whenever a Government officer sees an opportunity of introducing the cultivation among the lower classes in his district, a supply of plants should be furnished to him for gratuitous distribution, and every other practicable assistance afforded in the prosecution of the work.

6. I concur in the opinion of your Government, that it is expedient at this stage of the undertaking, that an experienced chemist and analyzer, possessed of a thorough knowledge of the chinchona and its products, should be appointed to investigate on the spot various points connected with the cultivation of the tree and the extraction and use of its alkaloids, without a determination of which a satisfactory decision cannot be passed on various questions now awaiting solution. The establishment of a manufactory of quinine and of the inferior products of the chinchona is the most important of these questions, and this cannot evidently be disposed of without further inquiry. I have, accordingly, resolved to sanction the appointment of an analytical chemist for a term of three years, and I shall lose no time in obtaining the services of a thoroughly qualified individual to proceed to your Presidency at as early a period as possible.

7. I approve the measures proposed to be taken by you for obtaining satisfactory reports on the relative efficiency of the various products of the chinchona bark proposed by Mr. Howard, and recently sent out to your Presidency.

8. Three copies of Mr. Howard's work will be transmitted to your Government, in accordance with the request contained in the 7th paragraph of your letter, No. 6, of the 13th March last.

I have, &c.
(signed) *De Grey and Ripon.*

— No. 87. —

From the Government of Madras to the Secretary of State for India.

Madras, 22 May 1866.

WE have the honour to forward for your information the accompanying Tabular Report on the number, condition, &c., of the Chinchona plants on the Neilgherries on the 30th April 1866.

Enclosure in No. 87.

REPORT on the Number, Distribution, and Condition of Chinchona Plants on the Neilgherries, on the 30th April 1866.

No. of Species.	Botanical Names.	Commercial Names.	Number of Plants.	Value per Lb. of Dry Bark in the London Market.	REMARKS.
1	<i>C. succirubra</i> - -	Red Bark - -	297,465	s. d. s. d. 2 6 to 8 9	<p>The weather being favourable planting operations have commenced. The number of plants planted out during the month being 1,819, making the total number permanently planted out 246,690.</p> <p>The increase by propagation is 54,272, being 3,934 under the average of the last six months, making the total number of plants 1,123,645.</p>
2	<i>C. Calisaya</i> , var. <i>Frutex</i>	Yellow Bark - -	37,481	2 10 to 7 -	
3	" " <i>Vera</i>				
3	<i>C. officinalis</i> , var. <i>Condaminea</i> (<i>C. Uritus-singa</i>).	Original Loxa Bark	608	2 10 to 7 -	
4	<i>C. officinalis</i> , var. <i>Bonplandiana</i> (<i>C. Chahuarguera</i>).	Select Crown Bark -	753,272	2 10 to 7 -	
5	<i>C. crespilla</i> - -	Fine Crown Bark -	4,360	2 10 to 6 -	
6	<i>C. lancifolia</i> - -	Pitayo Bark - -	198	1 8 to 2 10	
7	<i>C. nitida</i> - -	Genuine Grey Bark	2,786	1 8 to 2 9	
8	<i>C. Species</i> without name.	Fine Grey Bark -	8,500	1 8 to 2 10	
9	<i>C. micrantha</i> - -	Grey Bark - -	15,141	1 8 to 2 9	
10	<i>C. Peruviana</i> - -	Finest Grey Bark -	3,389	1 8 to 2 10	
11	<i>C. Pabudiana</i> - -	Unknown - -	425	Unknown.	
TOTAL Number of Plants - - -			1,123,645		

TABLE II.

MEMORANDUM of the Growth of Eleven Plants of *C. succirubra*, planted on the Second Denison Plantation at Nedddivuttum, on 30 August 1862.

Number of Plants.	Height in Inches when Planted, 30 August 1862.	Height in Inches on 31 March 1866.	Height in Inches on 30 April 1866.	Growth in Inches during April 1866.	By whom Planted.
1	28	134	136½	2½	His Excellency Sir W. Denison.
2	16½	119½	119½	-	
3	19	122½	123	½	
4	15	111½	111½	-	
5	27	138	141½	3½	
6	20	109	109	-	J. W. Brecks, Esq. Dr. Sanderson.
7	20	124½	124½	-	
8	18	125½	126½	1	J. D. Sim, Esq. Lieutenant McLeod.
9	20	130½	131	½	
10	20	133½	134½	½	P. Grant, Esq. Plant cut down for bark.
11	18	114½	116	1½	
12	-	83	83	-	

TABLE II. exhibits the growth of 11 plants of *Chinchona succirubra*, planted out by his Excellency the Governor, and other gentlemen, at Nedddivuttum, on the 30th August 1862. The average growth of these plants during the month is about one inch, or half an inch above the average growth of last month.

One of the two plants cut down on the 20th of March 1863 for the bark, submitted to Mr. Howard for analysis, has made strong shoots of 83 inches in height.

TABLE III.

SHOWING the Height of Twelve Plants of *C. officinalis*, planted on the Dodabetta Plantation at Ootacamund, on the 30th September 1863.

Number of Plants.	Height in Inches when Planted, 30 September 1863.	Height in Inches on 31 March 1866.	Height in Inches on 30 April 1866.	Growth in Inches during April 1866.	REMARKS.
1	19	111½	114	2½	<p>The 12 plants of <i>C. officinalis</i> (a shrubby species) on the Dodabetta plantation, gives an average growth of about 2½ inches, or ¼ of an inch above the growth of last month.</p> <p>Several plants of <i>C. succirubra</i> and <i>Calisaya</i> have furnished a good supply of fine seeds, which are now germinating freely.</p>
2	14½	98½	101	2½	
3	28	113½	116½	3	
4	22	108½	112	3½	
5	21½	116	118½	2½	
6	28	124½	126	½	
7	22½	107½	110½	3	
8	21½	108	110½	2½	
9	21½	119½	121½	2	
10	19½	112	115	3	
11	24	116	118½	3½	
12	24	115½	118	2½	

TABLE IV.

REGISTER of Chinchona Plants Distributed.

NAMES.	STATIONS.	Number of Plants.
Mr. F. N. Maltby - - - -	Travancore - - - -	16
Dr. Junghuhn - - - -	Java - - - -	56
Mr. A. R. Lascelles - - - -	Ootacamund - - - -	12
Mr. M. Anderson - - - -	Jamaica - - - -	2
Dr. Wiche - - - -	Bombay - - - -	10
Dr. T. Anderson - - - -	Calcutta - - - -	554
Dr. Jamieson - - - -	Saharanpore - - - -	107
Professor Lees - - - -	Calcutta - - - -	547
Rajah of Travancore - - - -	Travancore - - - -	521
Major Morgan - - - -	Ootacamund - - - -	1,534
Mr. E. T. Fitzgerald - - - -	Calcutta - - - -	558
Mr. J. W. B. Money - - - -	ditto - - - -	1,369
Mr. W. Bourne - - - -	ditto - - - -	582
Captain Cox - - - -	Wynad - - - -	6
Mr. Hollock - - - -	ditto - - - -	2
Mr. T. Sheffield - - - -	Ootacamund - - - -	12
Dr. F. Day - - - -	Cochin - - - -	100
Mr. Brown - - - -	Tellicherry - - - -	12
Mr. J. Hall - - - -	Ootacamund - - - -	156
Mr. T. Knop - - - -	ditto - - - -	18
Captain Lees - - - -	Bengal - - - -	386
Mr. W. H. Rayne - - - -	Manantoddy - - - -	424
Rev. — Sawyer - - - -	Ootacamund - - - -	1,018
Mr. Frend - - - -	ditto - - - -	512

The number of plants issued to the public during the month is 16,706, making the total number of plants distributed 100,688.

TABLE IV.—Register of Chinchona Plants Distributed—*continued*!

NAMES.	STATIONS.	Number of Plants.	REMARKS.
Mr. Hollock - - - -	Ootacamund - - -	1	
Mr. J. Pierie - - - -	Seegoor - - - -	12	
Colonel Scott - - - -	Ootacamund - - -	1,236	
Mr. Berend - - - -	Cachar - - - -	275	
Rev. J. Hunter - - - -	Coonoor - - - -	12	
Mr. J. Mullaly - - - -	ditto - - - -	160	
Mr. W. H. Stanes - - - -	ditto - - - -	1,262	
Colonel R. Cooper - - - -	Kotagherry - - -	12	
Mr. F. Cockburn - - - -	ditto - - - -	12	
Colonel Woodfall - - - -	Coonoor - - - -	12	
Mr. C. Anderson - - - -	ditto - - - -	24	
Colonel Angelo - - - -	Ootacamund - - -	12	
Rev. E. Laseron - - - -	ditto - - - -	12	
Captain R. N. Taylor - - - -	Coorg - - - -	96	
Major W. Agnew - - - -	Assam - - - -	139	
Mr. V. H. Levinge - - - -	Madura - - - -	12	
Chief Commissioner of - - - -	Nagpore - - - -	28	
Mr. Fletcher - - - -	Ootacamund - - -	24	
Gool Mahomed - - - -	ditto - - - -	20	
General M'Cleverty - - - -	New Zealand - - -	23	
Mr. W. Robinson - - - -	Kotagherry - - -	330	
Mr. Crake - - - -	Wynad - - - -	12	
Mr. H. R. Dawson - - - -	Seegoor - - - -	12	
Captain Mann - - - -	Coorg - - - -	48	
Mr. E. Roberts - - - -	ditto - - - -	530	
Mr. H. Russell - - - -	Wynad - - - -	52	
Rev. — Wait - - - -	Coonoor - - - -	2	
Collector of Belgaum - - - -	Belgaum - - - -	28	
Collector of Honore - - - -	Honore - - - -	28	
Dr. Ross - - - -	ditto - - - -	15	
His Excellency the Governor - - - -	Bombay - - - -	158	
Mr. H. Hinde - - - -	Wynad - - - -	12	
Mr. E. B. Thomas - - - -	Coonoor - - - -	74	
Rajah of Poonganoor - - - -	Poonganoor - - -	12	
Major Grant - - - -	Wellington - - -	226	
Messrs. Thomson, Shaw & Co - - - -	Poonganoor - - -	28	
Mr. J. H. Triuson - - - -	ditto - - - -	31	
Dr. Muller - - - -	Malbourne - - -	28	
Mr. Tyrrell - - - -	Mysore - - - -	12	
Dr. Sayers - - - -	Vellore - - - -	12	
Major C. P. Taylor - - - -	Ootacamund - - -	5,250	
Dr. Wilson - - - -	ditto - - - -	6	
Mr. Schuarrie - - - -	ditto - - - -	15,000	
Captain Fuller - - - -	Coonoor - - - -	417	
Dr. Drummond - - - -	Ootacamund - - -	224	
Captain Jennings - - - -	ditto - - - -	1,756	
Lieut. H. B. Montmorency - - - -	Bangalore - - -	6	
Mr. M'Hutchin - - - -	Ootacamund - - -	3	
Colonel Moleaworth - - - -	ditto - - - -	6	
Mr. C. Gray - - - -	Coonoor - - - -	12	
Mr. H. B. Leddell - - - -	Ootacamund - - -	12	
Mr. Minchin - - - -	Wynad - - - -	1,600	
His Excellency the Governor - - - -	Vizagapatam - - -	35	
Mr. R. F. Phillips - - - -	Kotagherry - - -	1,117	
Colonel Cooke - - - -	ditto - - - -	24	
Mr. G. J. Glasson - - - -	Wynad - - - -	1,000	
Dr. Macpherson - - - -	Mercara - - - -	400	
Mr. W. H. Kerr - - - -	Coorg - - - -	3,100	
Mr. James - - - -	Ootacamund - - -	1,000	

TABLE IV.—Register of Chinchona Plants Distributed—*continued.*

NAMES.	STATIONS.	Number of Plants.	REMARKS.
Colonel Whish - - - -	Bengal - - - -	82	
Mr. K. Mair - - - -	Calcutta - - - -	1,180	
Mr. W. Shakespear - - - -	ditto - - - -	61	
Mr. E. E. Meakin - - - -	ditto - - - -	168	
Mr. C. Ackland - - - -	ditto - - - -	150	
Mr. K. M'Iver - - - -	ditto - - - -	124	
Mr. Havelock - - - -	Ootacamund - - - -	12	
Mr. H. de Facien - - - -	Kartairy - - - -	6,821	
Major Sweet - - - -	ditto - - - -	910	
Captain Campbell - - - -	Bangalore - - - -	6	
Royal Gardens - - - -	Mauritius - - - -	36	
Honourable W. R. Arbuthnot - - - -	Wynad - - - -	93	
Mr. H. Maxwell - - - -	Bombay - - - -	50	
Mrs. C. Smith - - - -	Wynad - - - -	316	
Captain Beckley - - - -	Wellington - - - -	200	
Mr. Walsh - - - -	Salem - - - -	100	
His Excellency the Governor General - - - -	Java - - - -	175	
Captain Richardson - - - -	Kulhatty - - - -	509	
Rajah of Poonganoor - - - -	Poonganoor - - - -	24	
His Excellency the Governor - - - -	Madras - - - -	24	
Mr. J. W. B. Money - - - -	Ootacamund - - - -	25,000	
Captain Mitcheson - - - -	ditto - - - -	50	
Mr. R. H. Elliot - - - -	Munjerabad - - - -	157	
His Excellency the Governor General - - - -	Goa - - - -	252	
Colonel Phayre - - - -	Rangoon - - - -	152	
Mr. Ryall - - - -	Kotagherry - - - -	24	
Mr. J. Gordon - - - -	Coonoor - - - -	1,701	
Mr. J. Rohde - - - -	Neddivuttum - - - -	11,689	
Mr. J. Higginbotham - - - -	Goodaloor - - - -	12	
Mr. S. Pitol - - - -	Mauritius - - - -	36	
Mr. J. Horne - - - -	ditto - - - -	36	
M. Edouard Cremary - - - -	Reunion - - - -	51	
For the French Government - - - -	Algiers - - - -	45	
Mr. J. B. Norton - - - -	Shevaroy - - - -	50	
Mr. Mackay - - - -	Punjab - - - -	50	
Mr. W. Forsyth - - - -	Central Provinces - - - -	169	
Colonel Cadell - - - -	Coorg - - - -	62	
Mr. J. L. Browning - - - -	Wynad - - - -	4	
Mr. H. Leeds - - - -	Burmah - - - -	112	
Maloo Sait - - - -	ditto - - - -	6	
Mr. A. D. Brown - - - -	Dimhatty - - - -	53	
Mr. J. C. Misquith - - - -	Ootacamund - - - -	300	
Mr. J. L. Transsen - - - -	Coonoor - - - -	8	
Captain Fitzgerald - - - -	Calcutta - - - -	150	
Mr. J. Macpherson - - - -	Ootacamund - - - -	12	
Major Travers - - - -	ditto - - - -	5,000	
TOTAL Number of Plants - - -		100,688	

Ootacamund,
11 May 1866.

(signed) *W. G. McIvor,*
Superintendent, Government Chinchona Plantations.

— No. 38. —

REPORTS on the Wood of *Chinchona succirubra*.From Mr. *Robert Fauntleroy* to Dr. *Forbes Watson*.

7 April 1863.

I DULY received your favour of the 2nd, and also the specimen of *Chinchona* wood.

You would have heard from me sooner, had I not wished to lay the block before some of the workers in woods who frequent this yard.

No one has taken to it yet: the fact is the wood is too tender for turnery purposes; and, judging from the small size and defective growth, is not likely to be found of a size sufficiently large for mechanical or furniture purposes. (The proper term in our trade is "cabinet" purposes, but my word, furniture, appears appropriate.) One man says, "It would do as well as pear tree for patterns, only it is likely to be much smaller in the plank."

I will keep you informed of fresh opinions as they turn up, meantime the block lies before me daily, so as to be kept in mind.

 From Messrs. *Churchill & Sim* to Dr. *Forbes Watson*.

24 April 1863.

WE beg to acknowledge receipt of your favour of the 22nd instant, advising transmission of *Chinchona* wood, and requesting our opinion as to its commercial value for furniture, mechanical or other purposes, in this market.

Upon careful examination we find the insignificant bulk of this sample diminished by half consisting of sap, and it has neither the figure, grain, or hardness which gives wood value for constructive or decorative purposes.

Independent of the difficulty experienced in the introduction of a new foreign hardwood to the trade, the quantity and quality of those well known satisfy all demands, and the importation of new woods, even of a high character, is generally attended with loss.

Native-grown English timber, and Norway timber, from its proximity, enable consumers to have more than enough of cheap wood at prices which would be less than the freight from South America; and the appearance of the *Chinchona* tree does not indicate much more than fitness for firewood or the lowest uses.

— No. 89. —

From the Secretary of State for India to the Government of Madras.

My Lord,

India Office, 1 August 1866.

1. IN the despatch of my predecessor, dated 16th June 1866, you were apprised of his decision, that the operations at the Stanley Chinchona plantation in the Koondah hills should be continued.

2. These operations will necessitate the construction of a road from Ootacamund to the plantation, and I observe from your despatch, dated 13th March 1866, that it is your intention to have a good road made to the Koondahs as speedily as possible. This road will be useful to the private individuals who may open plantations on the Koondah hills, as well as to the Government. I would suggest that your attention should also be directed to the question of making an inexpensive bullock track from some point near the Stanley plantation to the low country, which might have the effect of bringing up supplies of provisions and labour from the Bowany valley and the Malabar districts in the direction of Manar. Such a means of communication would apparently have the effect of cheapening and facilitating all planting operations in the Koondah hills. Colonel Ouchterlony, in his Survey Report, speaks of these hills as likely hereafter to form one of the most valuable and important districts in the Madras Presidency.

3. It appears from your proceedings in this department that a new carriage road up the Coonoor Ghaut is in course of construction, at an estimated cost of upwards of two lacs of rupees, including the expense of preliminary surveys and of making the trace; as well as a road down the Goodaloor Ghaut, and a new road over the Neilgherry plateau, from Ootacamund to Neddiwuttum.

4. The new Coonoor Ghaut road is undoubtedly a work of great importance, and it may be worthy of consideration whether a cheap bullock track, continued from the first zigzag of the Coonoor Ghaut up the valley for a few miles, in the direction of Kartery, would not facilitate the formation of a bazaar, where it is much needed, in the immediate neighbourhood of numerous coffee and Chinchona plantations. If so, the original cost of the line might be recovered in a short time by the levy of moderate tolls.

5. I notice, with pleasure, the skill and energy which have been displayed by Captain Law in conducting the works on the Coonoor Ghaut, and also the success he has met with in introducing a system of contracts by piece-work so generally.

6. The new roads which have been sanctioned by your Government from Ootacamund to Neddiwuttum, and thence through the Chinchona plantations to Goodaloor in Wynaad, also appear to be important, and to be lines which will give rise to a traffic fully justifying the original outlay.

7. I shall be glad to be placed in possession of your opinions on the suggestions thus thrown out, and to be kept informed respecting the progress of the new roads on the Neilgherry and Koondah hills.

I have, &c.
(signed) *Cranborne.*

— No. 90. —

From the Government of Madras to the Secretary of State for India.

Madras, 24 April 1866.

We have the honour to forward, for your consideration and orders, the accompanying letter and its enclosure from Mr. C. R. Markham, recommending, for reasons therein stated, the grant of a pension of 500 rupees per annum to Mr. Spruce, the collector of the *C. succirubra*.

2. You will observe from Mr. McIvor's statement, forwarded with our despatch of this date, No. 16 (Miscellaneous), that the number of plants of *C. succirubra* at the Neilgherry plantation amounted on 31st March last to 301,067.

Enclosure No. 1, in No. 90.

From C. R. Markham, Esq., to the Secretary to Government, Revenue Department, Fort Saint George.

Bellary, 24 February 1866.

1. BEFORE leaving India I cannot refrain from bringing to the notice of the Government of Madras the position of Mr. Spruce, the collector of the succirubra, or red bark species of chinchona trees, in the hope that they will take such action as the circumstances of the case may appear to them to call for.

2. The *C. succirubra* trees now cover the sides of the Neddivuttum Hills, and the benefit to India that will be derived from their cultivation is, I am sure, fully appreciated by his Excellency in Council. I therefore feel some confidence in bringing Mr. Spruce's case to their notice.

3. Mr. Spruce, after years of toil in the tropical forests of the Amazon, solely with a view to the advancement of science, and after ruining his health in the service of India, has returned to England completely disabled by sickness, and in extreme poverty, owing to the breaking of a commercial house at Guayaquil, where he had deposited all his savings, his losses even extended to the sum he had received from the India Office as remuneration for collecting the plants and seeds of *C. succirubra*, and for the admirable scientific reports which accompanied them. His losses were owing to no fault or even imprudence on his part.

4. The enclosed statement, to which I beg to call special attention, will give some idea of the great services to science and to India which have been performed, in the midst of no ordinary difficulties, by this distinguished traveller and botanist.

5. Mr. Spruce's position was brought to the notice of Lord Palmerston, in a memorial signed by all the presidents of the leading scientific societies of London, as well as by Sir William and Dr. Hooker, and Dr. Lindley. The memorial prayed for a pension of 100 £ a year, in consideration of Mr. Spruce's great services to science, and of his present circumstances. The late Prime Minister, in considering the case, said that Mr. Spruce's most valuable practical service had been done for India, and that, therefore, the English list should only bear half the cost of his pension. He accordingly granted him a pension of 50 £.

6. Under these circumstances, looking to Lord Palmerston's expressed opinion, and to the results that India will derive from Mr. Spruce's labours, I cannot but hope that the Government of India will make up the pension to 100 £, and thus enable one, of whom his countrymen may well be proud, to pass his few remaining years in some sort of comfort. When India is deriving great revenues and inestimable blessings from the red bark, it will not be pleasant to reflect that the eminent botanist to whom she owes these advantages was allowed to die without the means of furnishing himself with those few comforts which a sick man requires. One hundred pounds a year would enable him to exist in his present sad condition,—50 £ would not. The grant, therefore, of this trifling pension of 500 rupees a year for a few short years, will make all the difference between absolute want and comparative comfort.

7. Any recommendation from the Government of Madras, whose members know personally the results of Mr. Spruce's services, must have great weight. Trusting that this subject will receive favourable consideration from his Excellency in Council.

I have, &c.

Enclosure No. 2, in No. 90.

STATEMENT of the Results of Mr. Richard Spruce's Travels in the Valley of the Amazon, and in the Andes of Peru and Ecuador.

1. MR. SPRUCE left Liverpool on the 7th of June 1849, and reached Pará on the 12th of July. After spending three months in exploring the environs of that city, he ascended the Amazon to Santarem, at the mouth of the Tapajoz; and, in November of the same year, went 70 miles farther up, to Obydos, where the Amazon is at its narrowest and deepest

1849.

- deepest. Starting from Obydos, he explored the Trombetas and its tributary the Aripicurú, as far as the cataracts of the latter, in latitude $0^{\circ} 47' N.$, fixing five latitudes by astronomical observations, and making a map of those previously unknown rivers.
1850. 2. Returning to Santarem in January 1850, he remained there exploring the lower part of the Tapajoz and adjacent parts of the Amazon until October, when he started up the Amazon for the Barra do Rio Negro, where he arrived after a voyage of 63 days, 30 whereof were spent in the channels to the south of the great island of Tupinambáana.
1851. 3. The greater part of the year 1851 was occupied in studying and collecting the rich vegetation of the lower part of the Rio Negro, and of the Amazon, for a few days' journey up; and in November he started for the head-waters of the Rio Negro, in a boat of about nine tons burthen, which he had fitted up expressly with that object.
1852. 4. Early in January 1852, Mr. Spruce reached the village of Sao Gabriel, situated about midway of the cachceiras or cataracts of the Rio Negro, and after remaining there some seven months, he proceeded up the large River Naupes, which had been scarcely known to Europeans, even by name, until Mr. Wallace's adventurous exploration of it the preceding year. Mr. Spruce found the Naupes to possess a more novel and beautiful forest-vegetation than any other part of South America, and his collections include several undescribed genera, besides many species notable for their beauty and the value of their products.
1853. 5. Mr. Spruce remained on the Naupes until March 1853, when he sailed out of it into the Rio Negro, and up the latter river beyond the Brazilian frontier, to San Carlos del Rio Negro. This village was his head quarters during his stay in Venezuela, which extended to November 1854, or more than a year and a half. During that time he made two expeditions to the Orinoco, one by way of the Casiquiari, and the other by the portage of Pimichití and the Atabapo. On the former of these, besides examining the Casiquiara, both ascending and descending, he explored its tributary, the Pacimoni, to its source, among the lofty and picturesque mountains called Imei and Tibiali; as also the River Cunucunúma, which bathes the western foot of the immense granite mass of Dinda, and enters the Orinoco a little below the bifurcation of the Casiquiari.
1854. 6. On his second visit to the Orinoco, he went as far down as the cataracts of Maypures, rendered famous by the narrative of Humboldt and Bonpland. There and elsewhere in the region of the Upper Orinoco and Rio Negro, he gathered many of the plants discovered by those illustrious travellers, and which had not been seen since by any botanist. He also constructed maps of the hitherto unsurveyed Rivers Cunucunúma and Pacimoni.
1855. 7. Leaving Venezuela, he descended the Rio Negro, and reached the Barra do Rio Negro about the end of 1854, after an absence of above three years. Having reposed there over two months, he took advantage of the steamers which had been lately established on the Amazon, to ascend that river beyond the Brazilian frontier, to Nanta, in Peru, near the mouth of the Ucayali, and from thence he went in canoes up the Maraúon and its tributary the Huallaga to Tarapoto, a large and thriving town in the ancient province of Maynas. In the lovely valley of Tarapoto, which, like many similar ones in the eastern roots of the Andes, will one day be the site of a magnificent city, when the immense resources of the Amazon valley and its unrivalled fluvial system shall have been fully developed; he remained nearly two years, and collected there, besides a vast variety of other plants, no fewer than 250 species of ferns, in an area of only 50 miles in diameter.
1856. 8. In March 1857, Mr. Spruce left Tarapoto for Ecuador, descending the Huallaga to its confluence with the Maraúon, then ascending the latter river and its affluents, the Pastasa and Bombonasa, to Canelos; finally through the forest of Canelos on foot to the village of Baños, at the foot of the volcano of Tunguragua. In this disastrous journey, which occupied a hundred days, he had to abandon all his goods in the forest, to escape perishing of hunger at the passage of swollen rivers.
1857. 9. Making Baños his head quarters, he devoted above six months to the exploration of the forests and paramos of its huge volcano, and of the upper part of the valley of the Pastasa.
1858. 10. In January 1858, he removed to Ambato, which for more than two years was his point of departure for excursions to Quito, Riobamba, &c., and to various points in the eastern and western Cordilleras of the Quitoian Andes, although his movements were much harassed and restricted by the revolutionary state of the country during nearly the whole of that period.
1859. 11. In 1860, Mr. Spruce communicated a valuable paper to the Royal Geographical Society, on the mountains of Llanganati, in the eastern Cordillera of the Quitoian Andes. (Journal for 1861, pages 163-184.) He has also communicated numerous important papers to the Linnæan Society.
1860. 12. In 1860 he was occupied for some months in procuring seeds and plants of the *Chinchona succirubra* or red bark plant, for cultivation in India, a task which was confided to him by Mr. Clements R. Markham, on behalf of Her Majesty's Government. Mr. Spruce displayed great zeal and resolution in performing this arduous service, while suffering from the effects of a rheumatic fever, and his labours received the unqualified approbation of the Secretary of State for India.
13. His elaborate report on the expedition conducted by him to procure these seeds and plants (accompanied by a meteorological journal, and a complete sketch of the vegetation of Chinchona forests), is by far the best that has appeared on this subject in any language; and has been invaluable as a guide to the cultivation of these precious plants in India. It covers 112 printed pages.

14. Afterwards, his broken health seeming to require a return to a warm climate, he removed to the plain of Guayaquil, and his active labours as a botanist, may be said to have closed with the picking up of a few plants in that neighbourhood during the year 1861, and during 1862 at Chanduy, on the coast, near Punta Santa Elena, where an exceptional rainy season, coming after an interval of 15 rainless years, enabled him to make a small but interesting collection of the ephemeral plants which under the influence of the rains sprang up on the desert, and also of several curious trees and shrubs whose blackened stems had not for some years past put forth even a leaf.

1861.

1862.

15. The results of this long course of travel (whose objects were at first purely botanical) comprise from 6,000 to 7,000 species of flowering plants and ferns, whereof a very large proportion were entirely new to science, especially among the trees, whose timber and other products were also ascertained to be in many cases of great value. Several new species may be instanced, and one entirely new genus, of trees producing the best kind of caoutchouc, which is now extracted from them in large quantities by the Brazilians, but was not before until Mr. Spruce pointed the trees out on the Rio Negro and elsewhere. His specimens of all these plants are preserved in the principal public and private collections in the world, and are, therefore, perfectly accessible for the purposes of science. A very large collection of cryptogamic plants, perhaps the largest ever made by any single collector, still remains to be worked up.

16. Mr. Spruce's MSS. contain, besides notes on all the plants collected, vocabularies of 21 native languages of the Amazon valley, meteorological observations, barometric levellings, &c., throughout the regions visited, maps of three rivers which had not previously been surveyed, notes of travel, of the aspects and capabilities of the various countries, of the customs, food, trade, and agriculture of their inhabitants.

Note by Mr. *Bentham*, President of the Linnæan Society, on Mr. *Spruce's* services to Botany.

1. MR. SPRUCE, before his expedition to South America, was well known for the zeal and assiduity with which he collected, and investigated, in various branches of botany, especially in the muscology of Yorkshire and the Pyrenees.

2. His researches into the vegetation of the interior of South America have been the most important that we have had since the days of Humboldt; not merely for the number of species he has collected, amounting to upwards of 7,000, but for the number of new generic forms with which he has enriched science; for his investigations into the economic uses of the plants of the countries he visited, for several doubtful questions of origin as to interesting genera and species which his discoveries have cleared up; and for the number and scientific value of his observations, made on the spot, and attached to the specimens preserved; all which specimens have been transmitted to this country, and complete sets deposited in the National Herbarium at Kew.

— No. 91. —

From the Secretary of State for India to the Government of Madras.

India Office, 1 August 1866.

I HAVE considered, in Council, your letter in the Revenue Department, dated the 24th of April 1866, forwarding a letter from Mr. Clements Markham, recommending, for reasons therein stated, the grant of a pension of 500 rupees per annum to Mr. Spruce, the collector of the *Chinchona succirubra*, of which a very large number of plants has been successfully planted out in the Neilgherry plantations.

2. There are not, in my opinion, sufficient grounds for the unusual course of granting a pension to Mr. Spruce, on account of the introduction of the *Chinchona succirubra*; but in recognition of the advantages derived by India from the services of that individual, I have granted to him a further donation of 200 l.

— No. 92. —

From Mr. *Bourdillon* (Secretary in the Public Department, India Office) to Mr. *Richard Spruce*.

Sir,

India Office, 27 July 1866.

I AM directed by the Secretary of State for India to acquaint you, that your services, in connection with the introduction of the *Chinchona succirubra* into India having been again brought under his consideration by Mr. Markham, his Lordship has been pleased to grant you a further donation of 200 l. in recognition of the advantages derived by India from your labours.

— No. 93. —

MEMORANDUM by Mr. *Markham* on Mr. *Spruce's* Claim.

26 July 1866.

THE Secretary of State has granted Mr. Spruce a sum of 200 *l.* He was granted 200 *l.* in 1863, and 360 *l.*; being payment for his work in the Chinchona forests, at the rate of 30 *l.* a month, from January to December 1860, in 1861.

The agreement was, that he should have his expenses paid while engaged in the service of the Secretary of State for India, and receive a salary at the rate of 30 *l.* a month.

From 15th July 1859 to 18th October 1859, he was engaged in exploring the forests, to ascertain the best localities for collecting plants and seeds of *Chinchona succirubra*. This was clearly a part of the actual service he was employed upon. He performed it at his own expense, and it entailed upon him a severe attack of fever. His expenses were at the rate of 30 *l.* a month, and his salary 90 *l.* for three months; total, 180 *l.*

From January to December 1860 he was actively engaged in the forests, collecting plants and seeds, and his expenses and salary of 360 *l.* for this period have been paid to him.

During January and February 1861, Mr. Spruce was occupied in getting together his horses and goods in the forest, where he had been established for a year, but he was unable to recover all his horses. Two of his mules were seized by a band of rebels. He was also engaged, during this time, in arranging and labelling the plants he collected in the Chinchona forests. He is entitled to his salary for these two months, amounting to 60 *l.*; and also to a small sum for expenses connected with the recovery of his horses, the loss of his mules, and for having used his own horses; being items he refrained from charging in his account; at least another 20 *l.*; total 80 *l.*

After leaving the forests he was attacked by fever, with threatenings of paralysis during March and April 1861; illness incurred in the service of the Secretary of State, which prevented him from commencing his Report, or from occupying himself in the employments by which he usually made his living. During this period he was entitled to his salary, 60 *l.*

He was employed in preparing his Report during the whole of May 1861, and in arranging his meteorological and other observations, and his botanical specimens. He was entitled to his salary during this period, 30 *l.*

Mr. Spruce's Report has proved of the greatest value to the cultivators of Chinchona plants in India and Ceylon. It is a careful and accurate treatise on the climate, soil, and flora of the "Red Bark" forests, and supplies information which could not have been obtained elsewhere. No work on that particular subject, which has appeared in Europe within the century, can be compared with it, in the amount of practical information which will be useful to cultivators. He is justly entitled to some remuneration for this most valuable Report, which he was directed to draw up, in addition to mere payment for his time. For his Report on the cotton of Peru, he received 20 *l.* (80 pages, or 5 *s.* a page). The Chinchona Report contains 110 pages, but they consist of very much more valuable matter, including a full scientific description of *C. succirubra*, and an elaborate meteorological journal. However, at the same rate as was paid for his Cotton Report, the just remuneration due to Mr. Spruce for his Chinchona Report is 27 *l.*

Before he had quite completed his Report, the illness contracted in the forests, in the service of the Secretary of State of India, came on again, and he has never been well since, nor able to resume any of the occupations by which he formerly obtained a living. He, however, managed to make out a copy of his rough notes by little and little; only able to write for a few minutes at a time with great pain and difficulty, and in a sitting posture, in a hammock. Under these circumstances, he was at last able to complete and send off his Report, in the end of September 1861. For the whole of this time, from June to September, he was thus employed in work connected with the Chinchona undertaking, during the intervals that severe illness contracted in the service permitted it; and he is clearly entitled to his salary for this period of four months, 120 *l.*

The

The account between Mr. Spruce and the Secretary of State for India, therefore stands as follows:—

Due to Mr. Spruce.		Paid to Mr. Spruce.	
	£. s. d.		£. s. d.
Salary for three months (15 July to 18 October 1859) in the Chinchona forests.	90 - -	Salary for 12 months (January to December 1860).	360 - -
Expenses for same period	90 - -	Further sum granted in April 1863	200 - -
Salary for 12 months (January to December 1860) in the Chinchona forests.	360 - -	Further sum granted in July 1866	200 - -
Salary for two months (January and February 1861) in the Chinchona forests.	60 - -		
Loss of mules and expenses connected with recovering his horses.	20 - -		
Salary for two months (March and April 1861) while suffering from fever contracted in the service.	60 - -		
Salary for one month (May 1861) while preparing his report.	30 - -		
Remuneration for Chinchona Report	27 - -		
Salary for four months (June to September 1861) while completing his report in the intervals of severe illness contracted in the service.	120 - -		
TOTAL sum due to Mr. Spruce	£. 857 - -	TOTAL sum paid to Mr. Spruce	£. 760 - -
			£. s. d.
Sum due	- - - - -		857 - -
Sum paid	- - - - -		760 - -
Portion of salary and expenses still due to Mr. Spruce	- - - - -		£. 97 - -

I am anxious that it should be clearly understood that Mr. Spruce's modest opinion of his own deserts, and his high sense of honour, have prevented him from making any representation himself on this subject, either directly or indirectly, since he sent in his original account of expenses and claim for salary for 12 months' work. But the fact that he has not represented his own case is, I respectfully submit, a reason why it should be most carefully considered by the Secretary of State. Not only has he received no special recognition of the great and valuable service he has rendered to India, but the sums rightfully due to him for actual salary and expenses have not been paid, even on the scale on which the amount of that salary was modestly fixed by himself. I must further represent that the salary thus fixed, is out of all proportion small when the high qualifications of the very eminent botanist who was employed, and the difficult and perilous nature of the service to be performed, are considered.

The value of Mr. Spruce's services may be calculated from the actual present value of the plantations of *C. succirubra* on the Neilgherries, in Ceylon, at Darjeeling, and in the Kangra valley. Twenty thousand pounds have already been offered for those at Neddiwuttum alone, and in three or four years they will realize double that amount. But the money value of the plantations does not represent the incalculable benefit which the collection of this species of Chinchona has conferred on the millions of people who suffer from fever in India. The high qualifications of Mr. Spruce, and the difficulties and dangers of the service he performed, must also be taken into consideration.

As my earnest appeal, through the Madras Government, for a small pension to this distinguished botanist, has been unsuccessful; and as he is to receive no special recognition of the great service he has performed for India, I respectfully submit that he should be at least paid the full amount which is due to him as salary and expenses. He was my most efficient, and my only educated and scientific assistant in South America, and I therefore feel it to be my duty to see, at least, that his case is clearly and distinctly stated.

Note.—The Secretary of State in Council sanctioned the further payment of 97 l. to Mr. Spruce, on August 16th, 1866.

CHINCHONA PLANTS on the NEILGHERRY HILLS, 1861, 1862, 1863, 1864, 1865, to April 1866.

DATE	C. succirubra.					C. Calisaya.	Chinchona yielding Grey Bark.				C. Officialis.				C. lancifolia.	C. Pahudiana.	Total Number of Plants.	Total Number Planted out.	Number of Plants Distributed to Private Persons.
	Number.	Average Monthly Growth.	Height of Tallest Plant.	Girth of Stem of Largest Plant.	Yield of Febrifuge Alkaloids.		C. micrantha.	C. nitida.	C. Peruviana.	C. Species without Name.	Variety Condaminca.	Variety Bonplandiana.	Variety crispa.	Average Monthly Growth.					
		Inches.	Ft. Ins.	Inches.	Per cent.								Inches.						
1861:																			
June	967	1½	2 6	-	-	6	511	430	28	172	-	-	-	-	-	-	2,114	-	
July	1,204	1½	2 10	-	-	6	802	714	36	211	-	-	-	-	-	-	2,978	-	
August	1,817	3	3 2	-	-	6	896	804	42	271	-	-	-	-	-	-	3,536	-	
September	2,361	2½	3 6	-	-	6	905	840	42	298	-	-	-	-	-	-	4,452	-	
October	3,197	2½	3 9	-	-	6	905	854	58	314	-	-	-	-	-	-	5,315	-	
November	3,477	2½	3 9	-	-	6	963	917	58	314	-	-	-	-	-	-	5,847	-	
December	4,762	-	-	-	-	6	1,228	917	64	314	-	-	-	-	-	-	7,466	-	
1862:																			
January	5,200	-	4 0	3½	-	59	1,497	1,050	64	314	-	-	-	4	425	-	8,613	-	
March	6,580	-	4 6	-	-	67	1,713	1,000	60	308	-	138	-	4	425	-	10,157	-	
August	80,150	-	-	-	-	1,050	7,400	8,500	2,295	2,440	41	20,030	236	1	425	-	72,568	-	
November	36,217	6½	-	-	-	1,286	8,110	8,542	2,477	2,514	820	27,957	287	1	425	-	91,747	35,000	
December	42,184	-	6 9	5½	-	1,372	8,148	8,565	2,574	2,542	850	37,731	464	1	425	-	117,706	35,000	
1863:																			
January	43,352	4	-	-	-	1,448	8,304	8,591	2,729	2,569	872	46,751	664	1	425	-	117,706	35,000	
February	45,507	3½	-	-	-	1,424	8,247	8,286	2,772	2,579	891	54,790	739	1	425	-	127,671	35,000	
March	49,989	3½	7 2	5½	-	1,480	8,326	8,312	2,847	2,595	927	61,012	825	1	425	-	135,789	35,000	
April	51,648	4½	-	-	-	1,540	8,424	8,326	2,937	2,623	969	68,757	903	1	425	-	146,548	35,750	1,619
May	53,854	5½	7 6	6½	-	1,587	8,517	8,345	2,961	2,638	1,051	77,322	1,003	1	425	-	157,704	41,897	
June	56,385	5½	-	-	-	1,607	8,584	8,358	2,939	2,654	1,103	84,050	1,056	4	425	-	167,215	43,028	
July	60,365	6½	-	-	43	1,571	8,734	8,380	3,038	2,681	1,197	104,871	1,085	4	425	-	181,534	58,401	
August	65,216	4½	-	-	-	1,627	8,956	8,385	3,062	2,706	1,269	119,616	1,126	4	425	-	197,689	64,783	
September	70,105	5	9 2	-	-	1,672	9,322	8,388	3,071	2,724	1,345	126,863	1,192	6	425	-	217,866	65,955	
October	76,599	1½	9 6	9½	6	1,725	9,473	8,394	3,097	2,734	2,880	126,863	1,280	6	425	-	233,476	66,622	4,373
November	80,550	3½	-	-	-	1,735	9,719	8,399	3,132	2,736	4,733	135,358	1,373	6	425	-	248,166	66,622	4,480
December	82,558	3½	-	-	-	1,750	9,936	8,402	3,143	2,741	6,219	142,717	1,449	6	425	-	259,396	66,622	5,562

1864 :																					
January	86,742	1½	-	-	-	-	-	1,768	10,139	8,406	3,153	2,745	6,350	155,780	1,569	2½	6	425	277,089	66,622	7,532
February	88,424	1	-	-	-	-	-	1,766	10,145	8,406	3,149	2,745	6,434	168,518	1,589	3	6	425	291,607	66,622	9,125
March	94,547	½	-	-	-	-	-	1,841	10,450	8,419	3,164	2,760	6,744	192,339	1,620	3½	6	425	322,315	66,622	10,825
April	97,918	1½	-	-	-	-	-	1,871	10,627	8,419	3,164	2,760	6,592	208,465	1,618	3½	8	425	341,865	66,622	11,398
May	91,046	1½	-	-	-	-	6	1,993	10,913	8,425	3,175	2,769	8,448	227,195	1,728	3½	8	425	351,125	118,922	31,123
June	102,344	1½	-	-	-	-	-	2,137	11,561	8,426	3,176	2,769	4,494	232,980	1,927	3½	12	425	385,247	144,316	31,662
July	107,262	2½	-	-	-	-	-	2,294	12,307	8,477	3,243	2,780	4,222	257,204	1,982	4½	18	425	400,214	159,666	33,677
August	113,400	3	-	-	-	-	-	2,369	12,839	8,481	3,303	2,780	1,661	262,964	2,103	1½	18	425	412,343	161,551	39,034
September	114,053	1½	-	-	-	-	-	2,392	13,084	8,488	3,331	2,780	567	277,682	2,062	3½	20	425	424,899	173,551	44,898
October	119,135	2	-	-	-	-	-	2,481	13,787	8,483	3,336	2,780	1,529	291,685	2,230	3	20	425	445,291	173,551	46,106
November	121,646	2½	-	-	-	-	-	2,527	13,854	8,494	3,378	2,786	1,787	300,817	2,304	2½	20	425	457,988	165,351	46,206
December	129,611	2½	18	6	11½	-	-	2,508	14,104	8,494	3,372	2,786	2,255	309,606	2,357	3	26	425	475,646	165,351	52,157
1865 :																					
January	138,119	½	-	-	-	-	-	2,560	14,314	8,500	3,372	2,786	2,705	324,276	2,367	2½	28	425	499,452	165,351	52,357
February	144,340	½	-	-	-	-	-	2,580	14,445	8,500	3,372	2,786	2,981	334,716	2,498	2½	30	425	516,683	165,351	52,357
March	152,964	¾	-	-	-	-	-	2,651	14,608	8,500	3,389	2,786	3,114	348,572	2,563	1½	30	425	539,602	165,351	52,837
April	161,273	¾	-	-	-	-	-	2,711	14,666	8,500	3,389	2,786	3,483	356,072	2,579	2½	39	425	555,922	165,351	53,437
May	150,686	¾	-	-	-	-	-	2,773	14,724	8,786	3,389	8,500	4,323	367,718	2,729	2½	58	425	558,105	167,371	78,611
June	160,711	1½	-	-	-	-	-	2,748	14,632	8,786	3,389	8,500	4,593	330,683	3,059	3½	52	425	581,678	182,236	78,819
July	179,345	3½	-	-	-	-	-	2,726	14,597	8,786	3,389	8,000	8,074	308,875	3,059	3½	64	425	621,840	193,244	79,233
August	211,345	1	-	-	-	-	-	3,158	14,899	8,786	3,389	8,000	8,559	436,962	3,139	8½	98	425	696,858	244,671	81,066
September	221,280	1½	-	-	-	-	-	3,138	14,893	8,786	3,389	8,000	8,489	509,021	3,139	3½	98	425	775,153	244,671	81,491
October	249,054	3	-	-	-	-	-	3,156	14,893	8,786	3,389	8,500	8,489	559,081	3,649	3½	128	425	853,550	244,671	81,809
November	262,927	1½	-	-	-	-	-	3,156	14,893	8,786	3,389	8,500	8,189	579,581	3,849	3½	159	425	887,854	244,671	83,676
December	-	-	17	6	15	11½	-	-	-	2,786	3,389	8,500	-	-	-	-	-	425	-	-	-
1866 :																					
January	284,276	1½	-	-	-	-	-	3,156	15,010	8,786	3,389	8,500	8,189	611,488	3,879	3	159	425	941,257	244,671	83,676
February	288,477	½	-	-	-	-	-	3,156	15,050	8,786	3,389	8,500	8,269	649,552	4,380	2½	159	425	984,143	244,671	-
March	290,855	¾	-	-	-	-	-	18,151	15,065	8,786	3,389	8,500	8,219	678,026	4,380	2½	198	425	1,028,796	244,671	83,934
April	301,087	½	-	-	-	-	-	32,701	15,119	8,786	3,389	8,500	8,195	709,319	4,380	1½	198	425	1,086,079	244,671	83,982
May	297,465	1	-	-	-	-	-	37,481	15,141	8,786	3,389	8,500	9,366	753,272	4,380	-	198	425	1,123,645	246,690	100,588

MAY 1866.

Total Number of Plants yielding Red Bark (<i>C. succirubra</i>)	297,465
" " " Yellow Bark (<i>C. Calisaya</i>)	37,481
" " " Grey Bark	29,818
" " " Crown Bark (<i>C. officinalis</i>)	758,259
" " " New Granada Bark	198
<i>C. Pahudiana</i>	425
Total	1,123,645

— II. —

COLLECTION OF SEEDS OF CHINCHONA DE PITAYO IN
SOUTH AMERICA.

— No. 1. —

MEMORANDUM by Mr. C. R. Markham, on Mr. Cross's Employment to Procure
Seeds of *Chinchona de Pitayo*.

IN order to complete the introduction of all the valuable kinds of *Chinchona* into India, I have always considered it to be very important that seeds of the species which grow at and near Pitayo, in New Granada, should be obtained. This species is very hardy, it yields a large per-centage of quinine, and it is likely to thrive in the Himalayas, as well as on the Neilgherries.

Accordingly, I obtained the sanction of the Secretary of State for India to make arrangements for the collection of seeds of the Pitayo *Chinchona*, and employed Mr. Cross on this service, who had served under Mr. Spruce in the collection of plants and seeds of the *Chinchona succirubra*, and had afterwards himself made a collection of the seeds of the *Chinchona officinalis* in the Loxa forests.

Mr. Cross set out on this difficult and important mission in the beginning of May 1863, from the table-land on the western slopes of the Chimborazo mountains, where he was then residing. The present report gives an account of his journey, and of his proceedings connected with the collection of *Chinchona* seeds at Pitayo. It is exceedingly interesting, because very few really observant travellers have ever gone over the same ground; and even Humboldt, who visited Popayan, never penetrated into the forests which were carefully examined by Mr. Cross. It also contains valuable information respecting the climate of the Pitayo region, which will be very serviceable to cultivators in India. Mr. Cross deserves great credit for the skilful and energetic way in which he performed a difficult service, and for his courage and perseverance in facing dangers and hardships of no ordinary nature.

Unfortunately he deviated from my instructions in not sending the seeds direct to England from Bogota, through the English Minister. He went back with them by way of Quito to Guayaquil, and the delay caused by this return journey, the terrible nature of which Mr. Cross has so graphically described, was fatal to the seeds. Not one of them has germinated.

I have obtained permission to employ Mr. Cross to make a second collection of the seeds of the Pitayo *Chinchona*, and there is every prospect that his labours will on this occasion be rewarded with more successful results. It is certainly most important that this species should be introduced into India.

The accompanying map is based on those of Restrepo and Humboldt, which, though very incomplete, are the best we have of the little known part of South America between Pasto and Bogota. Some additional names of places have been added from Mr. Cross's report, but the complaints of the want of good maps of this region, which were made by Caldas 50 years ago, as truly describe the state of things now.*

The first writer who described the country round Popayan and Pitayo was the Spanish *Conquistador*, Cieza de Leon. He accompanied the invading discoverers who, starting from Darien in 1536, ascended the valley of the Cauca, and reached Popayan. I translated and edited his charming "Cronica" last year, and it has been printed by the Hakluyt Society. The next author who treated of this region was the humane and generous, but unfortunate, Adelantado Andagoya, who was at Popayan in 1544. His narrative, which I have also translated and

edited,

* "Semanario de la Nueva Granada, p. 9."

edited, will be found amongst the collections of Navarrete. Ulloa, in his travels, gives a brief general account of the Popayan province. The only modern writers who have preceded Cross are Humboldt, Caldas, Karsten, and Vigne. Humboldt crossed the *paramo* of Quindiu, ascended the valley of the Cauca to Popayan in 1801, and went hence to Pasto and Quito. During his stay at Popayan he made an excursion to the village of Puracé. The learned Caldas was a native of Popayan. He was a good botanist and an excellent observer, and he knew the country well. Most of his writings are unfortunately still in manuscript, but some of them have been printed in the "Semanario de la Nueva Granada," amongst which there is a very valuable geographical memoir written in 1807. Dr. Karsten was for some years in this part of South America, investigating the botany of the Andes. I caused his notes on the medicinal Chinchona barks of New Granada to be translated in 1861, and copies were sent to India in the form of a pamphlet. Finally, Mr. Vigne travelled for his amusement from Quito to Bogota, going over exactly the same route as Cross, and his travels were published in 1863. Among these writers, Caldas and Vigne are the only ones who have gone over the same ground as Cross, and no one had given any account of the actual Pitayo forest previous to Cross's visit.

I have added a few explanatory foot-notes with the initials O. R. M.

India Office, March 1865.

Clements R. Markham.

— No. 2. —

From Mr. *Mocatta*, Acting Consul General in Ecuador, to the Secretary of State for India.

Sir,

Guayaquil, 14 February 1864.

I HAVE the honour to report, for the information of your Department, that I transmit to you by this mail, a tin case containing about one and a half million of seeds and specimens of the bark of the *Chinchona lancefolia* variety of Pitayo, collected by Mr. Robert Cross, in the Province of Pitayo, in the Republic of New Granada.

From information furnished by Mr. Cross, I am able to state that he started on the expedition in the beginning of May 1863, proceeding by way of Quito to Popayan, and thence to Pitayo, arriving there in the month of June. He finished the drying of the seeds in August, and after passing the *paramo* of Huanacas, proceeded down the great valley of the Magdalena to Tocayma, and thence diverging eastward, ascended the plains on which the city of Bogotá stands, arriving about the 16th September.

Not having received any instructions regarding the collection, but more particularly on account of the in-communication between Bogotá and Carthagena, he returned by way of Quito, with the collection to Guayaquil. He states that the road from Popayan to Quito was one continued mass of mud, and that the difficulties he encountered were very great. On passing the *paramo* of Huanacas, his muleteer and mules nearly perished from the cold. In passing through the valley of the Magdalena, he was forced to cross 15 rivers; of these seven were forded by means of canoes. All these difficulties were increased on account of the state of the country, caused by the war between Ecuador and New Granada.

On receiving at Quito a communication from Mr. Markham, he proceeded immediately to Guayaquil, notwithstanding the rainy season, and the very bad condition of the roads, and delivered the collection into my hands for transmission.

Mr. Cross describes the temperature of the climate in which this species of the Chinchona grows, as ranging from 30° to 60° Fahrenheit, and is decidedly of opinion that any plantation which may be formed for its cultivation, should be southward of the village of Ootacamund.

Mr. Cross also recommends that these seeds be sent to the Neilgherry Hills of India, as he believes that to be the locality best suited for this species of Chinchona. Mr. Cross also states his intention of furnishing a report of his journey,

with description of climate, soil, and general habit of the Chinchona of Pitayo, together with the mode of barking the trees.

I have, &c.

(signed) *Francis Mocatta*,
Her British Majesty's Acting Consul General.

Her Majesty's Secretary of State for India,
India Office, London.

— No. 3. —

From Mr. *Mocatta* to Mr. *C. R. Markham*.

Dear Sir,

Guayaquil, 14 May 1864.

I HAVE received your note of the 16th March last, and informed Mr. Cross that he is at liberty to draw on me for the sum of 150 *l.*, according to your instructions, as compensation for the collection of Chinchona seeds dispatched from this office on the 14th February last.

In his last letter to me, Mr. Cross states that ill-health has prevented him from furnishing the report on the culture, climate, and *habitat* of the Chinchona plant, as he had promised.

I remain, &c.

(signed) *Francis Mocatta*.

— No. 4. —

From Mr. *Cross* to the Under Secretary of State for India.

Sir,

N. Slopes of Chimborazo, 10 December 1864.

ON the 17th of April 1863, I received a communication from Mr. Clements R. Markham, respecting the collecting of seeds of the *Pitayo Chinchona* in New Granada, and I was instructed by him to proceed to the region of Pitayo, and examine the country around Purace, Hambalo, and Totoro, whence the finest bark (now comparatively scarce as an article of commerce) has yet been obtained. At the time I received these instructions I was residing near the "Red-bark" forests, on a high table-land on the western slopes of Chimborazo, at an elevation of 10,000 feet above the level of the sea.

The interior of New Granada was at this time in an unsettled state, and had been so for about two years previously. The roads, which in time of peace were scarcely passable, had during the revolutionary period been entirely neglected, and the contending parties, in order to arrest the progress of each other, broke down bridges, destroyed plantations of sugar-cane and bananas, and, in the lofty upland districts, where there existed wheat and other grains, the crops were burned, together with the farm-houses or other establishments. In this way the necessaries of life became so scarce, especially in the valleys of Patia and Popayan, that a single green plantain, about the size of those ripened in hot-houses in England, cost 3 *d.*; an ounce of wheaten bread, so bitter and full of earthy particles that it could scarcely be eaten, was procured with difficulty for 8 *d.*, and a pound of salt was sold in the village of Patia for 6 *l.* sterling.*

A glance at the map does not convey an idea of the extent of country traversed; besides which, many of the difficulties encountered were of a perilous nature, frequently endangering the loss of life. The whole journey was in fact a kind of martyrdom, during which excessive cold or heat, thirst, and hunger, were frequent companions; and the life of the wildest travelling savage was princely compared with mine, during the greater part of the way. The encampment for the night was often made away from other dwellings, sometimes on hot sand-covered plains beneath low spreading légumes, where formidable species of ants abounded in unlimited numbers; or in the bottom of deep ravines, where a rank vegetation

mostly

* Calculated according to the exchange of British currency at Guayaquil.

mostly prevailed; or among black volcanic rocks on wild stormy *paramos*.* Nevertheless, the grandly picturesque scenery of the country through which the way led compensated in some measure for the hardships endured.

Shortly before setting out, I purposed making a collection of plants by the way, which would have been interesting, as they would have conveyed an idea of the different tracts of country travelled over, but I was compelled to relinquish this object, owing to the great distance which had to be traversed in a given space of time. I found, too, in order to do full justice towards the Chinchona, that I must concentrate all my time and energy on that point, for no dependence is to be placed on the statements of the natives concerning anything, without a personal examination. Moreover, I wished to conceal as far as possible the actual object of my journey, lest the natives should, if aware, make an attempt to hinder or completely prevent the accomplishment of the object in view. I purchased mules for the journey, for, although they are to be obtained for hire in some places, yet it is not so everywhere, and besides, at every station where they are to be had, there is always a delay of several days, for time is of no importance to the Spanish American. With my own mules I was able to march as circumstances permitted, either by day or night, and make more rapid journeys than I could have done with hired animals.

On the 6th of May I commenced the ascent of the northern shoulder of Chimborazo, and about mid-day reached the highest part of the pass, which has an elevation of nearly 15,000 feet. On commencing the ascent, the way led over irregular rising ground, part of which bore crops of barley, wheat, and potatoes. Higher up, near the upper limit of forest, are extensive *paramos*, where only little patches of barley, and an edible species of *Oxalis* can be cultivated. Above this limit immense tracts are covered by a species of *Stipa*, which, with *Gentians*, *Chuquiragua insignis*, and other plants of the order *Asteracæ*, ran up to the very verge of perpetual snow. There can be no doubt that *Chuquiragua insignis* occupies one of the highest elevations of any shrub on the Andes.

On reaching the summit of the pass, a large plain called the "Arenal Grande" has to be crossed before descending the eastern slope. This plain consists of a yellow coloured *débris*, intermixed with fragments of burnt clay and lava. At some former period it seems to have been covered by a deposit of soil about three feet in depth, portions of which still remain; but, in consequence of the fierce tempests of rain and hail to which this lofty platform has been subjected, the greater part has been washed away. Two streams of considerable size, which rise from the base of wild, dark cliffs near the snow limit, and bear the names Rio Colorado and Rio Blanco (red and white rivers), flow westward through the "arenal," and ultimately find their way to the Pacific Ocean. On crossing the "Arenal Grande" the way led down steep grassy slopes on which grazed herds of sheep and llamas; and I soon found myself in a more genial temperature than that experienced on the summit of the pass.

There are two roads by which Chimborazo may be crossed: one passes over the southern shoulder of the snow-covered mountain, which is the principal route for travellers and commerce; and the other leads over the northern shoulder, and is the one mostly used by the Indians. The latter is rather higher than the southern pass, and leads for a considerable distance near the line of perpetual snow; but I was compelled to take this way, from the circumstance of being located beside it. At about 5 p.m. I reached a small farm on the edge of the *pajonales*, where I remained for the night. On the morning of the 7th the descent was resumed; when, after crossing a number of deep, dry ravines, I entered the town of Hambato about midday. Hambato is built on sloping ground, which is covered by a deep deposit of sand, on the southern bank of the river Hambato, which is merely a considerable stream of water, and takes its origin from the melting snows of Carguirazo and Chimboraza. In the surrounding districts, maize and European grains are raised on the sand-covered slopes by artificial irrigation; and there are also plantations of peaches, cherries, apples, and pears. All the fruits are inferior in size and flavour to those seen in the

English

* The word *paramo* is applied, in Ecuador and New Granada, to all those mountainous regions which are elevated from 10,000 to 15,000 feet above the sea, and in which a cold, rough, and misty climate prevails. The same tracts are called *punas* in Peru.—C. R. M.

English markets, owing to the poor varieties of trees which the inhabitants possess, and to their entire ignorance of the principles of cultivation.

I remained at Hambato until the 25th of May, for the road to the eastward of Tacunga had been rendered impassable by a great flood of water, which was said to come from a late eruption of Cotopaxi.

On the 25th the march was resumed, the way leading north-east over an irregular sand-covered plain, which here occupies the place of the Central Cordillera. The road on each side was well hedged in by monstrous specimens of *Agave Americana*, which flourishes in a temperature similar to that of an English summer.

Late in the afternoon I halted about a league to the eastward of Tacunga, immediately in front of the snow-covered cone of the volcano Cotopaxi. During the night a continual rumbling noise was heard from the volcano like loud thunder; and a red flame of fire and sparks rose to a height of not less than 1,000 feet above the summit of the crater.

On the 26th I proceeded across an extensive plain that lies along the base of Cotopaxi, which appears to have been formed entirely of matter thrown from the volcano. The vegetation here was exceedingly scanty, consisting of several cactæ, a gynerium, and a few composites. On leaving this plain, the way led over a lofty ridge, which separates the desert land that lies around the base of Cotopaxi from the green plains of Quito. About 4 p.m. I reached the village of Machache, where I remained for the night.

May 27th, I travelled over undulating plains of rich pasturage, and entered the city of Quito about four in the afternoon. At Quito I met with Dr. Jameson, Professor of Botany in the University, and director of the mint, to whose labours in the cause of botany scientific men are chiefly indebted for the knowledge possessed of many rare plants that are only found at very high elevations on the Quitenian Andes. This, without an exception, was the best and most honest gentleman I have yet met anywhere during my travels, and I have been often assisted by him in various ways.

Quito is situated in an extensive plain, on each side of which run ridges of lofty mountains, the higher summits of which are covered by perpetual snow. The streets of the city are in general irregularly formed, badly paved, filthy, and the drainage is insufficient. The houses are mostly built of mud bricks, and covered with tiles. The population presents a mixed appearance of effeminate refinement and degradation or barbarism; the wealthier classes of Spanish Americans walk about the streets attired in the newest fashions of Paris, while side by side, with merely a piece of dirty coarse cloth wrapped round their waists, and with loads of mud bricks on their backs, run the ever dutiful children of the Incas. The city is chiefly remarkable for its churches, convents, and monasteries, employing it is said, one way and another, nearly 1,000 priests; which, judging from the hosts that are continually flapping along the streets in various coloured vestments, I can well believe. No branch of commerce or manufacture is carried on to any extent; the people seem daily engaged in devotional exercises at the churches, where a kind of chanting is always to be heard, and ringing of bells perpetually.

On the 3rd of June I left Quito, accompanied by a muleteer, and pursuing a northerly course for two hours came to the ravine of Guallabamba, which had to be crossed, and which was one of the steepest descents I have yet seen. The descent, which occupied two hours, brought us from a cold table-land, fit only for grain and potatoes, to a hot climate where bananas and other fruits grew and ripened in abundance. I stayed for the night beside a little hut near the bottom of the ravine, where food was procurable for the mules.

On the 4th, about 2 a.m., the mules were saddled, and I proceeded by moonlight over an arid tract of country, and, as day broke, began the ascent of a high table-land which lies to the northward of the snow-clad mountain Cayambe. The march was continued over this lofty plain until dusk; when I halted at the ruins of a farm-house that had once pertained to the Jesuits of Quito. During the night I was perfectly famished with cold, for the only shelter I had was a little hut which had no walls, and the wind, coming down from the snowy slopes of Cayambe, swept violently through it and rendered it most uncomfortable.

At daylight on the 5th the mules were caught with great difficulty on account of the cold, and I proceeded over an irregular tract of country until mid-day, when

when the way descended to a flat green plain, which had in its centre a small lake (Laguna de San Pablo), on the eastern side of which is the village of San Pablo, and on the western the ancient town of Otobalo. The scenery of this locality is very beautiful. On the eastern border of the lake is seen the snow-capped mountain of Imbabura, which presents more regular and symmetrical slopes than any other mountain I have seen in South America. At the base of this extensive mountain, in a little green plain which slopes down to the edge of the lake, are a number of green hillocks or tumuli, which mark the resting places of the ancient caciques of the Incas. The low-lying land which surrounds the lake is, in fact, full of tumuli, and so is the adjoining valley of Cotacache; but some of those near the latter place are 400 feet high, and, as the soil was all carried thither by Indians, must have cost a great amount of labour.

After passing along the eastern border of the lake, the way led down a steep descent to a tropical valley, in which stands the city of Ibarra, which I reached about dusk. Ibarra is a city of considerable extent, and has a cathedral and some large churches, but it presents no commercial feature. Sugar cane, bananas, and chirimoyas grow everywhere around, and the land is evidently of a very fertile character.

On the 8th I left Ibarra, and ascended a lofty sand-covered ridge, and then descended to the river and valley of Chota, whence a zigzag ascent led up to the paramo of Yascon, which is about two miles to the southward of the Indian village of Mira. A halt was made for the night on a flat plain above Yascon, the mules being fastened with ropes to feed near the encampment, and removed every two hours, and this plan enabled me to march early without time being lost in catching them.

On the 9th I went on to a village called Tusa, over very lofty cold plains, mostly barren; the deposit appearing to consist of volcanic sand and mud, but bound so together that nothing except a few half-starved Gyneriums exist in holes or gullies, which retain the rain water until it evaporates.

June 10th, I left Tusa, and, after passing over a series of cold table-lands, entered a forest about mid-day, which continued all the way to Guaca, where I arrived about dusk. Guaca is a small village in the heart of the forest, subjected to torrents of rain and mist all the year round. About three miles to the eastward there runs a lofty ridge of forest-covered mountains, which is the Cordillera Orientale, whence Chinchona bark is sometimes taken, out, but it is of inferior quality.

On the 11th I proceeded northward, and after four hours' journey through the forest, ascended the lofty paramo of Bolichi, which is clothed with *Melastomacæ*, brambles, and a species of *Stipa*; and thence descended to an undulating plain, enjoying a mild temperature, in which stands the town of Tulcan,* where I halted for a short time, and then pushed forward to the village of Carlosamos, that lies to the northward of the River Carchi, which is the dividing line between the republics of Ecuador and New Granada. At this place I was examined by the New Granada officials, to see whether I was not carrying contraband goods across the frontier. After some delay, I left for the village of Pastasa.

On the morning of the 12th I left Pastasa, and, after crossing a low, forest-covered eminence, came out on the cold plain of Tuquerres, which has a general elevation of 10,500 feet. This plain is of great extent, and has large tracts of marshy land, especially along the base of the mountains of Cumbal and Chiles. I saw here a *Barnadesia* with white flowers; and on the drier slopes a dwarf species of gentian, in full bloom, covered the ground as thickly as daisies do any pasture field in England. On several of the mountain slopes which surround this plain, grows abundantly the *Chinchona lancifolia*, var. *corymbosa* of Karsten, but it is not now collected.

Towards the close of the day I passed through the village of Tuquerres, which is an exceedingly cold, miserable-looking place, and the streets are knee-deep with mud. Beyond Tuquerres, the way led down a deep descent to the bottom of a tropical ravine called the Huaytara; but I remained for the night above the tropical limit, in consequence of the great number of bats which exist near the bottom of the ravine.

On the morning of the 13th the march was continued, and the whole day was spent

* See Vigne's Travels, ii. p. 227.—C. R. M.

spent in crossing the ravine and getting out of the reach of the bats on the eastern bank.

June 14th, I left the Huaytara and ascended a high, forest-covered ridge, and, after crossing the summit, descended to a green valley of no great extent, in which is situated the city of Pasto. The valley enjoys a mild temperature, and is surrounded by forest-covered mountains, from whence is obtained a species of *Chinchona*, which is exported mostly to the United States. Around the town, and along the base of the mountains, are fine fields of pasture; but at the time of my visit they were completely eaten up by the swarms of cattle belonging to the New Granada Government. Pasto is famous for its vegetable dyes, but they are all brought by the Indians from the banks of the Caqueta and Aguatico. I remained at Pasto until the 25th, because I thought it my duty to examine the adjoining forests, in order to see what kind of bark was there collected. None is now collected on the volcano of Pasto, which is only a short distance to the westward of the city; but considerable quantities, at the time of my visit, were collected on the mountains which bound Pasto to the south-east, near to the Lagoons, where the Incas formed their most northern colony before the Spanish conquest, and where the Quichua language is still spoken.

There was much bark at this time in Pasto, and also in sheds in the forests, but no one cared much about buying it, as the yield of quinine is often too small to leave any profit. This bark has a yellow or orange colour, and the fracture is very coarse and fibrous. The tree is evidently the *Chinchona lancifolia* of Karsten and others. It grows to a great size, has large lanceolate, coriaceous leaves, and the bark, which is covered with a silvery epidermis, presents vertical cracks, or gashes, on the surface. I did not make any effort to collect seeds here, as I had received undoubted intelligence that the best bark was found near the city of Popayan.

On the 26th June I left Pasto, and travelled over a mountainous ridge for four hours, when the way led down a precipitous slope to a little hamlet called Ortega.

Early on the morning of the 27th I departed from Ortega, and after traversing several grassy slopes, I descended by a series of stony *travesias* to the bottom of a deep ravine, through which rushed a large body of red-coloured water over a precipitous descent of rocks and large stones, that kept it in perpetual foam, and its noise was distinctly heard at the distance of a mile. This is the ravine of Guanhambu.* On reaching the bottom of the ravine, the way led to the edge of a profoundly deep precipice, below which raged the river in all its fury, and from this point travellers are conveyed to a rock on the other side by a basket, or other contrivance, which is suspended from several cords, that are stretched from one side of the ravine, or abyss, to the other, and this is termed a *taraviti*. When I had dismounted, I went to the tree to which the *taraviti* was fastened, and looked over into the bottom of the ravine; and certainly it was not until some little time afterwards that I resolved to cross. I might indeed have avoided the *taraviti*, by taking the high road by way of Almaguer, but this way was much shorter, and, on the whole, a better road. When the mules were unsaddled they were taken down to a wide part of the river, nearly half a mile below the *taraviti*, where the banks were low, and driven into the river, and where, partly by swimming, and in part by leaping from one rock to another, they reached the opposite bank evidently very much fatigued. On returning to the precipice, I found that the *taravitero* was waiting for me, and, as the muleteer appeared doubtful about the strength of the *taraviti*, I proposed to go over first. I was accordingly bound in the ordinary way to the apparatus, and told by the *taravitero* to go forward to the edge of the precipice, when he immediately pulled the cord, which drew me on to the *taraviti*, and, after an aerial journey of a few seconds, I reached the cliff on the opposite side.†

The muleteer could scarcely be persuaded to take his seat on the *taraviti*, but the *taravitero* at length got over his scruples, by giving him some aguardiente. When the muleteer had crossed, the mules were secured for the night in a piece of land at the base of a lofty cliff, near the river bank.

The *taraviti* of Guanhambu, at the time I crossed it, was composed of six cords

* Vigne calls it the Huaramba, ii. p. 233.—C. R. M.

† "A tight rope forms the bridge here, on a slope to the lower and opposite bank, so that the traveller and his baggage descended with rapidity."—Vigne, ii. p. 233.—C. R. M.

cords* of salted raw hide, twisted, and dried in the sun. Its length, from the tree to which it is fastened on the southern side, to the one on the northern bank, is 70 yards (English measurement), and is undoubtedly the longest of the few *taravitis* which still exist in South America. A forked stick, resembling the letter V inverted, is placed over the cords, and to the ends of this stick are fastened strips of raw hide, by which the traveller is bound round the waist and thighs. The southern side of the *taraviti* is much higher than the northern one, so that instead of pulling the traveller across, it is necessary to check his progress by a cord of raw hide, which is tied round the waist, in order to prevent him being dashed to pieces on the opposite side. The whole affair has a notably dangerous appearance, and might cause a revulsion of feeling similar to that experienced by some persons on first beholding a place of execution.

On the 28th I left the *taraviti*, and, after passing over a number of ascents and descents, came to the base of a lofty ridge covered with forest; which is the mountain of Veraguas, or La Union. The ascent of this ridge was commenced about 10 a.m., and at five in the afternoon I descended the eastern slope to the village of La Union, which is situated near the base of the ridge.

On the 30th of June I descended a series of slopes to the valley of Patia, † and halted for the night on the edge of a ravine, at the base of a pass called "Salto de Mayo." On the first of July I ascended the pass, which, although of low altitude, is one of the most difficult and dangerous on the Andes. It is mostly composed of black volcanic rocks, which appear like a number of dark pillars, piled horizontally one above the other. The mules had to leap from one to another of these rounded precipices, at one time ascending, at another descending, for a distance of three miles. I traversed the pass on foot (but both hands and feet were in operation many times together) and left my mule to follow, which came springing up behind me with a steadiness and precision almost incredible. About mid-day I reached the edge of the plain, over which I continued to travel until dusk, when a halt was made at the village of Mercaderes.

July 3rd, the march was continued, when after a journey of three miles, the way led down a steep, gravelly slope to a low-lying plain of sand, covered with leguminous trees, through which flows the river of Patia. The mules, on reaching the river bank, at once entered the water, probably on account of the excessive heat; but before they were half way across the water was up to the saddles, and they all began to swim. I therefore returned to the bank, where shortly afterwards I found a negro, with whom I agreed to ford the river. After several attempts, a place was found much higher up, with a hard bottom, but the water was very deep, which rendered the passage dangerous. The river rises from two deep ravines that come out from the Cordillera Orientale, and the passable fords are about 20 yards above the junction of the streams which flow from these two separate ravines. And so, on proceeding a short distance onwards, I found I had still another branch to cross, but fortunately there was a canoe, which ferried me over, while the mules, on being divested of their harness, swam across. There are many lives lost annually in the river, and at the *taraviti* of Guanambu. A halt was made as the day closed beneath some leguminous trees, which form the principal part of the arborescent vegetation of the hot plains.

At two o'clock a.m. of the 4th, I recommenced the journey by moonlight, for the heat during the day was almost insufferable, alike to man and beast. Little lakes and patches of water, dotted over with *Nymphæas* and other aquatic plants, glimmered in the uncertain moonlight, among clumps of low spreading Leguminosæ; but, as the day broke, I saw that some of the patches of water were fringed with an interesting vegetation, consisting of a species of *Equisetum* 12 or 14 feet high; handsome variegated *Caladiums*, *Begonias* grew in the shade, and many plants of *Oxidium Papilio* hung from the trees. At about four in the afternoon I ascended a rugged piece of ground on the edge of the plain, and put up at the house of a negro, at a place called "Piedra Rica." The inmates of this establishment were in a complete state of nudity; and the master of the house, a tall negro, about 60 years of age, but remarkably lean and half deformed, wanted to convert the sweating cloths belonging to my mules into a pair of trousers. I may here state that

* The Government order is "that there be not less than eight strong cords in the *taraviti*."

† At the time of the Spanish conquest, the valley of Patia was very densely peopled, but the inhabitants were massacred by Balacazar. Cieza de Leon describes the valley, and the humane Andageya tells us that the chief of Patia was very friendly to him.—C. R. M.

that in no other part of the globe is there to be found people possessed of such thieving propensities as the Spanish Americans; and this remark applies equally to president and people, for whatever property a man may possess, or whatever be his station, it forms no security against thieving, lying, or indeed any kind of dishonesty.

July 5th, I left "Piedra Rica," and passed over low hills, composed apparently of clay, and covered by a coarse species of *Gramineæ*. On these hills are a number of gold washings that, owing to the scarcity of water in summer, are only wrought during the rainy season. About five p.m. I halted at Dolores. Dolores is a small village of about 50 houses, and is situated at the base of a ridge of hills which separates the valley of Patia from the valley of Popayan. I slept for the night on the summit of this ridge, whence a fine view was obtained of the plains of Patia and Popayan. Both are plains of great extent, studded with rounded hills, and long, wavy ridges from 20 to 500 feet in height, and surrounded by lofty mountains, whose precipitous fronts, wild, broken inequalities, and immensely deep steep-sided ravines, present to the beholder a landscape undoubtedly one of the wildest and grandest in nature. The surrounding mountains are mostly composed of a kind of slate rock in a state of decay, and easily separable into thin laminæ, but this deposit is frequently covered with black volcanic *débris*, which gives to the mountains a dark, sombre aspect.

On the 7th of July I left the mountain of Dolores, and, after passing over an undulating tract of tropical country, descended to the low-lying plain or valley in which is situated the city of Popayan.* The red gleams of the setting sun shone on the whitened spires and domes of the cathedral and churches, and gave to the city an appearance of splendour which an examination of the interior does not confirm. The houses are similar in construction to those of most other South American cities, being built of mud bricks, which are afterwards plastered with mud mixed with cut straw, and then painted with clay or lime. The streets are paved with round stones carried from the bed of the adjacent River Cauca, and so irregularly placed that they seem to have fallen from the crater of some volcano; and the interspaces and cavities thus afford a place for refuse of all kinds, and stagnant water, which is allowed to remain until it evaporates.

Popayan is famous as being the birthplace of the unfortunate Caldas. Some of his manuscripts, which I had the privilege of perusing, contain an account of his grand discovery in taking altitudes with the thermometer by boiling water, together with lists of plants, and their virtues when prepared in a particular way; and long dissertations respecting the effects of temperature in certain tracts of country on the colour, stature, and intelligence of the different races which people the globe. Caldas spent the greater part of his life in the rich, fertile valley of Popayan, surrounded by clumps of orange and mangoe trees, and large-leaved bananas, in a temperature pleasant but in no degree oppressive, and so he appears to have entertained a great horror of the severity of the winters in Northern Europe, and, in some measure, of its people also. Many of the plants which he records as possessing medicinal properties bear names in the Spanish language. Caldas was shot at Bogota, by order of the Spanish general, Morillo, at the time of the separation of the colonies, and while he was attempting to make gunpowder for the revolutionists.†

On the 7th of July I left Popayan, and proceeded for about three leagues down the eastern bank of the River Cauca, when the way led round to the north-east, close to the ancient Indian village of Paniquita, over low hills of red clay, mostly covered by shrubby *Melastomaceæ* and pipers. Not a single stone or rock was to be seen anywhere, the hills appearing to consist entirely of alluvial deposit. As I travelled farther to the eastward, loftier hills came in view; but the red clay still continued, with its covering of *Melastomaceæ*, pipers, and
brambles,

* Popayan is situated in the beautiful valley of the Cauca, at the foot of the great volcanos of Puracé and Sotara, in latitude 2° 26' 17" N., and 5,800 feet above the sea.—C. R. M.

† Don Francisco José de Caldas was one of the most eminent scientific men that South America has yet produced. He was associated with Mutis in the botanical expedition of New Granada, and explored the Chinchona regions of the Andes from Bogota to Loxa. Caldas was born at Popayan in the year 1770, and from early youth devoted himself to the pursuits of science with untiring energy. He constructed his own barometer and sextant, and, ignorant of the methods adopted in Europe, he discovered the way of ascertaining altitudes by a boiling-point thermometer. Many of the memoirs of this remarkable man are in manuscript, and others are lost to us for ever. He was murdered by the brutal Morillo on October 30th, 1816.—C. R. M.

brambles, which, however, were different species from those seen on the edge of the plain. My intentions were to reach the village of Sylvania this day, but the morning was spent in catching the mules near Popayan, so I remained for the night at a solitary house about an hour's march from the village.

On the 12th I crossed a broad ridge, and proceeded up a valley, in which lies, in a scattered position, the village of Sylvania, which is the principal head quarters of those who buy the Pitayo, Hambalo, Ambalo, Totoro, and Puracé bark. Several miles to the eastward of Sylvania there runs, north and south, a forest-covered ridge of lofty hills, and from the western slopes of this ridge run westward a number of hills of lesser altitude, which vary in height and form, until they gradually subside to the westward, and appear as low swellings, or green undulations, on the edge of the Cauca valley.

One day's journey to the southward of Sylvania, in a deep valley, lies the village of Totoro, and about six hours' journey to the south of Totoro, at the base of a forest-covered slope, from the crest of which rises the snow-covered volcano of Puracé,* with its chimneys of sulphureous vapour, its subterranean fires still burning, is the Indian village of Puracé. As the mules were tired, I devoted some time to the yellow-bark farm of Ambalo, which is only a few hundred yards distant from Sylvania, and whence a considerable quantity of bark was formerly taken out; but the plants are now very small, and so, in many instances, are not worth taking up. The farm of Ambalo is of considerable extent, but there is little cultivation, because the ridges are very steep, and even present low cliffs of rock in several places. The land was originally covered with forest, but the greater part has been cut down for grazing purposes, and I observed that in places where cattle fed, although the ordinary shrubby vegetation abounded, there was no Chinchona. I searched this place for two days, and also farther to the southward, near Totoro, but obtained only a few seeds, as the land is easily searched, and lies near to the dwellings of the Indians, who never allow the plants to attain any size. The Cascarilleros, who are mostly Indians, assured me that not a single tree was to be found in the Pitayo forests, and that the tallest plants met with were not more than six feet high. I was so much disheartened by this information that I thought of removing with my mules to Totoro, and continuing the search round that place and Puracé. Besides, the seeds had approached maturity, for many of the capsules had burst open, and this circumstance increased my anxiety, because I had hopes of getting together a collection, by patient searching, if I went towards the south, while, on the other hand, I was aware that the Chinchona of Pitayo was superior to all the others, and brought the highest price. And so, if I went to Totoro and Puracé, I would lose the seeds of Pitayo; but again, the chance of seeds at Pitayo was not great, and if I went there I might search all the forests and find none, and on my return to Puracé get nothing but empty capsules. However, after some consideration, I resolved to go on to Pitayo, and if I only found one single panicle on any of the trees, to form an encampment on the spot, and remain there until it was well ripened, and thus make sure of at least a few seeds of this much-esteemed species.

Accordingly, on the 15th of July I left Sylvania by daylight, and proceeded eastward towards the base of the lofty forest-covered ridge of hills which runs north and south to the eastward of Sylvania; and after a rapid journey of two hours over rising grounds, came to the ascent, which winds in a zigzag manner to the summit of the ridge. On ascending about 200 feet I saw a young plant of Pitayo Chinchona, about 18 inches in height, and higher up several more were met with, almost equally small. The surrounding trees of the forest here were low and spreading, but this habit is assumed by almost all trees

* Humboldt and Bonpland visited the volcano of Puracé in November 1801. Humboldt says that, on ascending the volcano, at an elevation of 8,500 feet, there is a small plain inhabited by Indians, and cultivated with the greatest care. This delightful plain is bounded by two very deep ravines, on the brink of which precipices the houses of the village of Puracé are built. Water springs out profusely from the porphyritic rock, and every garden is enclosed by a hedge of euphorbiums, with slender leaves of the most delicate green. The contrast of this beautiful verdure with the chain of black and arid mountains which surround the volcano, and which are cleft and torn asunder by earthquakes, struck Humboldt as most agreeable. Puracé is celebrated for the beautiful cataracts of the River Pusambio, the waters of which are acid, and are called by the Spaniards *Rio Vinagre*. Humboldt made a sketch of these falls (*Vues des Cordillères*), as they are seen from the garden of an Indian of Puracé, which is extremely picturesque.—C. R. M.

trees on the Andes at high elevations, and is, according to Humboldt, influenced by the amount of atmospheric pressure.

On reaching the summit of the ridge, I travelled for about an hour over a comparatively level tract of forest-covered country, having on the right a high frowning precipice, and on the left an immensely deep ravine. This is the *Piñon de Pitayo*. Large masses of stone lay scattered about among the trees and portions also of a brittle slate rock, of which the hill seems to be composed, had fallen from the cliffs above, and, like the slate rock all over the Andes, is in an advanced state of decay. A thick undergrowth prevailed, consisting of some beautiful blue and yellow flowered chinchonaceous shrubs, a species of *Smilax*, brambles, and a great abundance of *Pteris aquilina*. The *Piñon de Pitayo* has an elevation a little over 8,000 feet. The elevation was taken with the thermometer by boiling water, 604 feet being allowed for every degree of Fahrenheit. The Chinchona was found growing here, and on the cliffs which rose high on the right, and likewise near the bottom of the deep ravine to the left. The finest Chinchona bark has been got from the precipices on each side of the road, but especially from those on the right. I ran into the forest every few yards, but only found little heaps of peeled plants from two to three feet in length, and some of them were not thicker than a writing quill.

On leaving the *Piñon*, the way led down the eastern slope of the ridge, and descended over steep declivities of slate rock to a circular valley, in which is situated the village of Pitayo. The valley is surrounded by high conical hills and long, wavy ridges, on the summits of which are bare grassy *paramos*, but lower down are cliffs of slate rock, below which spreads out a dark, sombre forest that extends to the bottom of the valley. The day was far spent when I entered the village, for I had delayed a considerable time on the *Piñon*, and the declining rays of the sun were only visible on the rugged precipices and black masses of rock that adorn the summits of the mountains to the eastward. I had previously learned that there was only one white man in the village. On entering I saw a white man seated in a corridor turning some Chinchona bark which had been placed there to dry. I asked him whether he could oblige me with a corner of his house for a week; to which he replied that he had a little dark room in which was a quantity of Chinchona bark and some wheat; if I liked it I might put my things therein. On looking inside I said it would answer well, for, although the sleeping place was, as heretofore, on the ground, still it was dry, a circumstance which I valued very much. On entering into conversation with this person, he informed me that he was the magistrate of Pitayo, and asked if I had come to buy Chinchona bark. I said I would like to see some, but, besides, I had other diligences.* He inquired very anxiously if I had brought any tobacco, when I told the muleteer to bring a small bag which contained this article, and made him a present of three large leaves, which he said he "appreciated almost as much as his life." Subsequently I learned how very scarce the Chinchona trees were in the forests of Pitayo, indeed he informed me that there were no plants much larger than those I had seen on the way, but added that his two sons, young lads about 18 years of age, had been collecting bark in the forests for nearly three years, this being the only occupation they could pursue, in order to escape the military conscription, and that when they came home I could obtain every information from them. Shortly after nightfall they arrived, each carrying a large knife or *machete*, and a bag containing about six or eight pounds of green bark. I was informed by these two lads that the only trees of any size in the Pitayo region were in the possession of two Indians, one of whom lived on the brow of the hill immediately above the village, and the other below the edge of the *Piñon de Pitayo*. I was previously aware that three kinds of bark were supposed to exist in the Pitayo and surrounding districts, under the names *red* or *canela*, *yellow*, and *white*. The *red* commands the highest price, as the foreign buyers in Sylvia find, after repeated trials, that it yields the greatest quantity of quinine, the *yellow* is held next in estimation, while the *white* brings the lowest price of all. The *red* or *canela* is only found in the surrounding forests of Pitayo and the *Piñon de Pitayo*; but the *yellow* has a much wider range, as it is collected on the farm of Ambalo, and around the village of Hambalo, which is near Pitayo, and likewise at Totoro.

On

* *Otras diligencias.*

On the 16th of July I rose early, and after having looked to the mules, took the muleteer with me, and commenced the ascent of the hill slope immediately above the village, where one of the Indians who possessed Chinchona trees was said to live. The ascent was along the edge of a ravine for about two hours, when, on reaching the brow of the hill, the Indian's hut was descried close at hand, surrounded by patches of barley, wheat, and potatoes. On reaching the hut, the barking of the house-dog brought the inmates to the door, and an aged Indian beckoned me to enter the dwelling. Although the domicile was small, there were four or five families living in it, all probably related to each other, who spoke the *Paez* language,* not a single word of which I could understand. Fortunately, however, some of the elder members of the hut understood a little Spanish. Before entering the hut, I observed several Chinchona trees within an enclosure behind it, and I now requested permission to look at them, which was granted. I accordingly entered the enclosure, accompanied by the Indians, and found there were four young trees, about 15 feet high. One of them was well laden with capsules, some of which had already burst open, and the greater number would probably do so in two or three days. After looking attentively at the trees, I offered the Indian about one shilling if he would allow me to gather the capsules, and the money was at once accepted. A light Indian boy was then directed to mount the tree, who, as instructed, broke off the panicles and put them into a bag which was held up to receive them. A good number of the capsules were small, and the seeds they contained would not come to maturity, but after rejecting these, I had 450 well-ripened capsules. The other trees, although about the same size, had only a few panicles, which were small and green, and not worth collecting.

This place, which was scarcely a mile to the southward of the Piñon, had nearly the same elevation, and is backed by the same steep ridges of rocks that were seen on the right, on crossing the Piñon de Pitayo. The soil around was a dark brown friable loam mixed with small pebbles, and having a substratum of loose rock, which in some places was of volcanic origin, and in others appeared as a kind of slate of a deep bluish colour. In some parts the surface soil very much resembled peat; it was almost black, and of a very spongy nature, and consisted probably of decayed trunks of trees and the shrubby hard-foliaged species of Chinchona which prevail mostly at high elevations on the Andes. In the surrounding forest there were open spots where there were but few trees, but in such places, and on the brows and slopes of the ravines which furrow the hill, the common fern, *Pteris aquilina*, formed thickets, through which it was necessary to cut away before any progress could be made. The colour and depth of the soil differed in several places, from light brown to nearly black, and from a few inches to three or four feet in depth, but in all such situations the general vigour of the Chinchona plants appeared to be the same. This Chinchona, like all the other quinine-producing species I have become acquainted with throughout the Andes, is always restricted to dry slopes or hollows, and is never found in wet ground: so that in cultivating the Chinchona this point should be particularly attended to.

When all the good capsules had been secured, I desired the Indian to sell me one pound of bark from the tree whence the seeds were taken, to which he demurred, as he thought it would kill the tree, but said, if I liked he would take up some suckers, which came from the root, none of which were thicker than a common walking stick. As there was no other hope of getting specimens, and as my friend, Professor Jameson, of Quito, had charged me to be sure and bring some for analysis, I assented, and several of the younger Indians were immediately set to work with knives and *machetes*, when, on clearing the earth away from the base of the suckers, they dug them up by the roots, and then handed the plants to an old Indian, who barked the roots and the lower portion of the stem. The barking is rather tedious work, for, unlike all the other Chinchonas I have seen, the bark cannot be taken off in lengths of a foot or so, but breaks away in little chips about two or three inches in length, a circumstance which may in some measure account for its superior quality. A small patch of maize and potatoes,

near

* Cieza de Leon says that "to the eastward of Popayan is the extensive province of the Paez Indians, who have worked so much evil to the Spaniards," and he goes on to give a very interesting account of them.—See my translation of Cieza de Leon, p. 116.—C. R. M.

near to the Chinchona trees, had suffered from a late frost, which testifies that this Chinchona will bear three or four degrees of frost without being injured in any way. The thermometer here in the morning stood at 45 degrees Fahrenheit, but below, at the village of Pitayo, it was five degrees higher, showing that this Chinchona, like all the others that grow at high elevations, enjoys a considerable range of temperature. I searched all the trees for specimens in flower, but only found one branchlet bearing a panicle in bloom. At the close of the day I returned to the village, and found that the Indians had during my absence lodged a complaint against my mules, saying that they would eat up all the herbage in Pitayo. The cleared land is held in common by all the Indians; and as people from other parts rarely visit Pitayo, no provision is made for the accommodation of more animals than those belonging to the inhabitants of the village.

The Indians of Pitayo speak the *Paez* language, which is quite distinct from the *Quichua* of the Indians of Ecuador, Peru, and Bolivia; and what appears more strange, it is said to have no relation whatever to the language *Guambiana*, which is spoken by the adjacent Indians of Sylvia, Totoro, Paniquita, and Puracé.*

To the eastward of Pitayo lies a wild mountainous tract of country called "Tierra adentro," i. e., land within, which is said to be thickly populated by Indians, whose numerous tribes speak five idioms besides the *Paez* language. The Indians of "Tierra adentro" are declared to be cannibals, which I do not believe, although all those from this region that I have yet seen presented a very formidable aspect, and appeared quite capable of devouring their fellow Indians, or in fact any one else. The tribes are perpetually at war with each other, and they are the most vindictive Indians in equinoctial America. On their journeys through the forest they always travel in a single line, one behind another, every one treading in the footsteps of the first; and by this method the danger of snake-bites is, in a great degree, diminished. Although there are many salt springs throughout this vast territory, yet the Indians derive no benefit from them, being entirely unacquainted with the use of salt as an addition to their food. They all carry the blowing cane and a bunch of short arrows in a sheath, the points of which are poisoned with a substance which is probably one of the most virulent poisons in existence. It is prepared by the Indians from the root a climber, which from their description I suppose to be a plant belonging to the order *Loganiaceæ*: the root is bruised, macerated in hot water, and strained. The residue is afterwards boiled down, until it acquires the consistence of molasses, when on cooling it becomes hard and black, and looks like a piece of opium. Direct exposure to the air for any considerable length of time is said to destroy its active properties. The Indians, therefore, carry it in a very small earthen jar, or in a piece of jointed bamboo, which is carefully stopped, so as to exclude the air. When they wish to apply it, a small portion is held near to the fire, when, in about a minute, it becomes soft like wax, and the points of the arrows are then rubbed upon it and placed in the sheath. The moment one of these arrows strikes a wild hog, monkey, or fowl, they appear to be seized with spasmodic convulsions, which, however, only last for a few moments, for they almost instantly expire. No bad results follow on eating venison which has been procured in this way, so that it may be taken internally without injury. Strange enough, certainly, that these savages, who know nothing of the principles of chemistry, should be capable of manufacturing an article the active powers of which, in one way, seem greater than even those of *aconite*.

On the 18th of July I left Pitayo, and recrossing the Piñon, descended to Sylvia, which was the only place in which there existed pasture for my mules, and where food, scarcely sufficient to maintain a bare existence, could be procured.

On the 19th I left Sylvia on foot, and searched a mountain to the north-west of the Piñon, but although a few plants were met with, they were all too small to bear seeds.

On the 20th I again left Sylvia on foot by daybreak, taking with me two days' provisions, and directed my course to a ravine which runs along the base of the Piñon, where the other Indian, who, I was told, possessed Chinchona

trees,

* These Indians are descended from the ancient Coconucos, of whom Cieza de Leon gives an account. See my translation of his *Cronica*, p. 115.—C. R. M.

trees, was said to live. This Indian's name was Almendrez, and the magistrate's sons in Pitayo informed me that he lived in some part of the ravine, although the exact locality was uncertain, as he had several clearings at considerable distances from each other. After several hours' journey I reached the ravine, and travelled along its edge through thick primitive forest for about an hour, when I suddenly came out on a small clearing, which was sown with maize and wheat. On looking about for some time I discovered a house in a hollow, near the edge of the forest. On reaching this dwelling I found it to be a hut of very humble dimensions, deserted, but containing a stone for grinding grain, and three old black clay pots, which had been fashioned by the hand and dried in the sun. From the hut I again plunged into the forest, and after travelling eastward along the edge of the ravine for another mile, or more, I discovered a house in a hollow near the edge of the ravine, whence a considerable amount of smoke was issuing, and around the house grew a number of Chinchona trees, which, in order to show that they were private property, were encircled by a fence. I immediately looked out for a large stick, to combat the dog which might be expected to sally forth on approaching the house, and getting over the fence, went straight to the dwelling, and called out the ordinary salutation, to which there was no response made. I therefore inferred that there was no one within, and so proceeded to examine the Chinchona trees, the largest of which, although standing, were peeled, and their leaves were already beginning to turn brown and fall off. A good number of capsules, just bursting, were observed on some of the younger trees, which had not been barked; and, after instructing the muleteer to bring the seed bag, I was about to break off some of the finer panicles, when the Indian entered the clearing, and shouted to me, believing, I suppose, that I was stealing his Chinchona bark. On going up to him, I explained the object of my visit, and after making him a present of two pieces of bread and some tobacco, offered him about 2s. if he would allow me to collect the capsules from the trees, to which he agreed. When the Indian had devoured the bread, which was considered a treat of no ordinary kind, I entered into conversation with him respecting the origin of the plantation, and why the trees had been peeled standing. He informed me that about four years ago, on cutting down a portion of forest where his house now stands, he found a great number of young Chinchona plants, which grew so thickly together, that it seemed as if they had been planted (*sembrado*), although such could not be the case, as the forest cut down was of primitive origin; and that, after erecting the house, he enclosed the plantation with a fence, hoping in a few years to get several *quintales* of bark from it, for the bark even at this time was no longer procurable in large quantities. The trees continued to thrive well until a few days previous to my visit, when one night of clear moonlight, while the Indian was staying at a little clearing which he had farther up the ravine, several persons had entered the plantation, and divested all the finest trees of their bark, both from trunks and roots. The thieves were believed to be *Cascarilleros practicos*, most of whom ~~stay~~ in the forest, and it was supposed that they had been hovering around the dwelling for several days, waiting for a favourable opportunity.

I was nearly an hour occupied in collecting the capsules from the different trees, some of which contained the finest seed I have ever yet collected on the Andes. On finishing the work, I returned to Sylvia the same day. As I knew the natives were jealous concerning the Chinchona, I resolved to dry the seeds in as quiet a place as possible; therefore I left Sylvia on the 23d, and put up at a farmhouse called Miraflores, a little way below Totoro, and close to the road that leads over the *paramo* of Guanacas, to the valley of the Magdalena. On reaching Miraflores I carried the seeds in a piece of cotton cloth to the side of a ravine, where there was not much wind, and spread them out to the sun, for there were still a considerable number of capsules which had not burst open, but in about eight days the greater number did so, and then the collection in all contained not less than one million and a-half of seeds. If, however, I had been six or eight days later I could not have gathered a tenth part of this collection of seeds; for the grand harvest was procured from the trees on the edge of the Piñon, many of the capsules of which were at the time just bursting, and so were in the best possible condition for collecting. Shortly after I made the collection, the Indian, finding that many of the larger trees which had been

barked would not recover, rooted up the plantation and sold the bark. When the seeds were well dried, I picked out the greater number of the capsules and threw them away, reserving only a few among the seeds, in order to keep them open and allow a free circulation of air. I next occupied myself in taking the temperature of the Chinchona region around Totoro. It will be understood that when any plant is found growing on a mountain slope, from the base to near the summit, that the plants growing near the base, although of the same species, enjoy a milder temperature than those near its crest. This, therefore, is the case with the *Pitayo Chinchona*. It enjoys a wider range than the red bark, which is mostly (although not always) found growing where coffee, cotton, and sugar-cane may be planted; while the Chinchona of Pitayo is found growing in that elevated region where wheat, barley, and potatoes can only be cultivated. Near the upper limit of the Chinchona neither wheat nor potatoes can be well grown, and even the barley is thin and dwarfish. The temperature at the lowest limit of the Chinchona rose during the hottest days to 59° or 60°, but at night fell to 46° or 48°, and at certain periods of the year it might fall to freezing point. The thermometer at the upper limit, which was near the edge of the *pujonales*, where the forest was particularly low and stunted, ranged during the day from 44° to 48°, and fell at night to 35° or 36° Fah. Although it did not happen during my stay in this locality, yet I am certain that the temperature in this higher region not unfrequently falls during the summer season three or four degrees below freezing point. My own opinion is, therefore, that this Chinchona should be planted in situations where, in the dry season, the temperature may fall occasionally three or four degrees below freezing point, and where the daily variation in the dry season will be eight, ten, or twelve degrees. In the rainy season the temperature in the Chinchona forest does not often fall below freezing point, nor does the daily variation exceed three or four degrees, but this is attributable to the watery exhalations which fill the atmosphere, and prevent a rapid circulation of air from the summits of the lofty mountains.

During my travels on the Andes I have found, after many trials, that the temperature of any locality cannot be correctly calculated by merely taking the altitude. Thus I have found the wild potato growing near the summit of a mountain in stunted forests, at an elevation of 11,000 feet, while around Loxa I never saw it much above 8,000 feet. The mountain alluded to, however, was bounded by hot plains, whence the heated atmosphere ascended the deep ravines which furrowed the slopes, and thus modified the temperature of the loftier regions. In order to have obtained a general idea of the temperature of the Pitayo region, I should have remained there for the space of one year, during which time I would have been able to register the temperature of the wet and dry seasons; but in the present case this could not be accomplished, and, besides, although such a register would have been interesting, it is not absolutely necessary; for, as already shown, this Chinchona enjoys a considerable range of temperature, which is indeed requisite for its existence and development; and on looking at the circumstances under which it flourished with a practical eye, on the day I crossed the Pitayo mountains, I felt perfectly satisfied that it would succeed on the Neilgherry hills of India.

With respect to the rainy period of the year, I was informed that the rains commenced in November, and ended in April or May. The intervening months of summer are not perhaps without occasional showers, but there cannot be a great abundance of rain, for the grass on the cleared lands is burnt every summer, in the same way as that on the summits of the Neilgherries. On the forest-covered slopes the ground is naturally more moist, because evaporation is considerably retarded by the mass of green foliage which covers it, and besides, in the forest the ground is covered with fallen leaves, which are gradually decomposing, and thus preserve the humidity of the soil and atmosphere.

The general vegetation of the Chinchona region, apart from the arborescent vegetation,—some of which was new to me, and moreover was not determinable; as few of the trees were in bloom,—consisted of pipers, solanums, blue and yellow flowered chinchonaceous trees and shrubs, brugmanzias, fuchsias, escallonias, berberis, two species of smilax, calceolarias, menthas, a new species of gunnera, salvias, ranunculus and composites. The bulk of the cryptogamous vegetation consisted of *Pteris aquilina*, which is very abundant, and which I saw also on the Neilgherries, *lastreas*, *polystichums*, *blechnums*, *aspleniums*, *lomarias* or *braineas*, *cystopteris*,

cystopteris, gleichenias, hymenophyllums, and jamesonias. Several species of selaginellas, and two species of lycopodiums, were found on the banks of ravines in deep shady places.

The winds in summer are often very violent and strong, but do not appear to be injurious in any way to the Chinchonas. During my stay there was generally bright sunshine in the daytime, and towards evening it became cloudy; but the forests were very rarely enveloped in mist, which lay high up on the grassy *paramos*, far above the forest limit, although a little before dusk there was sometimes a very light drizzly shower, which lasted for about half an hour or less, and was usually succeeded during the night by very heavy dews. In clear nights it was observable that the deeper ravines on the forest-covered slopes often became filled with a white vapour, which, however, was perfectly stationary, and rapidly disappeared with the first rays of the morning sun.

The Chinchona plants are sometimes seen growing on gentle declivities, but they are found much more frequently on very steep slopes, such as the banks of ravines and precipitous hill slopes. I have already referred to the fact that three kinds of Chinchona are believed to exist in Pitayo and the surrounding districts, under the names "red or canela," "yellow," and "white," the first mentioned of which is declared to be the best. In packing, however, the three sorts are thrown together and beaten nearly to a powder, and then put in bales. The three kinds do not differ in habit of growth in any particular, nor even in the colour or structure of the inflorescence, and as far as could be observed they all grow at nearly the same elevation, and enjoy the same range of temperature, although apparently not the same amount of moisture. The white bark has a pale yellow colour, and, to an unpractised eye, does not appear different from what is termed the yellow kind, and in fact I believe it to be exactly the same. The white bark grows around the base of the snow-covered volcano Puracé, which is almost perpetually enveloped in storms of rain and hail, and a portion of these tempests in general extend to the Chinchona forests of Puracé. To the northward of Puracé, on the same ridge of mountains, occurs what is termed the yellow bark, which certainly shares little of the storms from the snow-covered volcano; and further north still is the Pitayo variety or species, which, as it is situated at a considerable distance from Puracé, appears to escape the tempests which impinge on the forests to the southward. I attribute the pale colour of the Puracé bark to the excessive amount of moisture it receives. The exterior of the Pitayo bark is yellow, and the inner surface appears yellow also, but if attentively examined a reddish stain is seen on the inner surface, and this forms the distinguishing point between the Chinchona of Pitayo and that of Totoro and Puracé. This difference, although of a slight nature, is always constant; and as that of Pitayo steadily yields a greater per-centage of quinine than any kind in New Granada, and as quinine can be obtained from it at a much earlier period of growth than from the other kinds, it seems well entitled to be considered as a distinct species.

Most persons who have written on the Chinchona of the Andes, represent it as flourishing amidst perpetual torrents of rain and thick mist, without scarcely ever enjoying a moment of sunshine. Now, I have been in localities on the Andes which had altitudes similar to that of the cold Chinchona region, where only a species of *Solanum* would grow, and which looked as if on the point of extinction, from the abundance of mosses which covered it, that besides hanging in long strings from the trunks and branches, twined round the smallest shoots to the very points, and appeared to retard the development of the few leaves which crowned the terminal branchlets. In these localities the mosses were continually dropping water, and heavy showers fell almost every day, while during the night the rain came down in perfect sheets, shrouded in a thick mist, which rarely dissipated until midday. No Chinchona could live in such a climate, nor even if planted in similar situations could the trees ripen their seeds, for a certain amount of dry weather and sunshine is necessary for the ripening of the capsules, and for their bursting in order that the seeds may fall to the earth. The Chinchona climate is certainly moist for about six or eight months of the year, and in cultivating this plant it is expedient to seek very humid situations, because the mountains of India do not appear to receive the same amount of moisture as the lofty elevations in America. Nevertheless it will be understood that the natural climate of the commercial Chinchona has been misrepresented by most South American travellers.

The *Pitayo Chinchona* differs essentially from the *C. lancifolia* of Karsten in being a more slender tree, often found formerly from 60 to 70 feet in height; but such trees were rarely more than 18 inches or two feet in diameter, with very slender branches, bearing small lanceolate leaves, which before falling always assumes a purple or deep red colour. The *C. lancifolia* to which Karsten refers extends over a wider tract of country than any other Chinchona on the Andes. This tree, however, is much more massive, and bears considerably larger leaves than those of the *Pitayo Chinchona*. This large-leaved Chinchona inhabits the western slopes of the Cordillera Orientale, in situations presenting conditions favourable for its development, between Pasto and the city of Santa Fé de Bogota; while the finer kinds of Pitayo bark are limited to a few square miles of steep forest-covered slopes to the northward of the volcano Puracé, which belongs properly to the central Cordillera. The map of the Chinchona region of New Granada lately made for Dr. Weddell is nothing more than a piece of superfluous paper covered with errors, because it represents certain tracts of country as mountainous, and covered with Chinchona forests, while such tracts really exist as hot arenaceous plains or savannas covered with low spreading leguminous trees, where no Chinchona ever grew, and very probably never will, unless indeed a general upheaval of such tracts of country should take place.

Karsten states that the bark is not taken from the roots of the *C. lancifolia*, which in most instances is true; but this is not the case with that of Pitayo, the bark from the roots of which is much more valuable than that from the trunks or branches. Further he asserts that the *C. lancifolia* is never likely to become scarce, and that the continual cutting of the Chinchona trees will rather augment than diminish the number of plants, and this may be true concerning his *C. lancifolia*, about which no one cares much, as the yield of quinine is often too small to cover the expense of collecting; but as regards the Pitayo bark there is one thing very certain, that at the present time there is more difficulty in collecting one pound than there was formerly in collecting one hundred weight.

The Pitayo bark will very probably be found the best of all the species for cultivation, as it is said to grow very rapidly, which is a matter of great importance. It may certainly be barked when it is six feet high, although it would not be an advisable practice to do so before the trees are at least 30 feet high. Bark taken from large trees in Pitayo was said to give nearly four per cent., while bark taken from the roots of the same trees gave five per cent. of quinine.

I was informed by the foreign dealers in Sylvania that all the bark taken from Pitayo is sent to France. The bark sold in England under that name is not true Pitayo bark, but comes from the mountains which border on the valley of the Magdalena, and from Almaquer and Pasto, and is certainly from the *C. lancifolia* of Karsten, which as regards quality is very inferior to that of Pitayo. True Pitayo bark may be known in England by not being much thicker than common window glass, because it is all taken from small plants, the large trees having been destroyed long ago, and by its being full of earthy particles, on account of so much bark being taken from the roots of the plants. The Chinchona alluded to by Karsten is rarely collected when less than one-fourth of an inch in thickness; but I have sometimes seen it nearly an inch thick after the epidermis had been scraped off.

On the 7th of August I prepared to march for the city of Santa Fé de Bogota, by way of the *paramo* of Guanacas, for although the route by the Quindiu Pass was preferable, it was not open at the time, on account of a revolution which was going on in the Cauca valley. Guanacas is a word belonging to the Indian language Guambiana, and is said to imply an impossibility, or the performance of anything accompanied with great risk or difficulty. And so, on inquiry, I was informed that no one could cross this mountain ridge during the months of July, August, and September without suffering severe hardships and running the risk of perishing in the storms which prevail on the *paramos* during these three months. Nevertheless, I resolved on taking this road, because by doing so I should be enabled to determine the character of the Chinchona which is taken from the mountains on the edge of the Magdalena valley, and thus form an acquaintance with all the Chinchona localities of New Granada. I was not able to procure a guide for the *paramo*, for all the able-bodied inhabitants, including Indians, had been taken for military service, and so I was obliged to trust to the experience I had gained in making out solitary and intricate paths on the Andes.

In

In securing the seeds, I first put them into a bag of cotton cloth, and then wound about two yards of the same cloth round the bag, which was afterwards placed in another bag of double india-rubber cloth, perfectly waterproof, and strapped behind the saddle. My reason for rolling so much cloth round the seed bag, was to prevent the seeds from sustaining any injury from the india-rubber cloth, or from the atmosphere, while crossing the *paramo* of Guanacas. From this time until the day I delivered the seeds I inspected them daily, lest they should be attacked by mildew.

On the 8th of August I left the farm of Miraflores, and after an hour's journey to the north-east passed through the village of Totoro, and commenced the ascent of Guanacas.* The way led directly up the mountain slope, which was covered with low stunted forest, until a crest or ridge was reached which had an elevation of 12,000 feet, whence a large tract of *paramo* is seen at a slightly lower elevation, diversified by patches of shrubs, lagoons, and long ridges of low hills, on which grew a species of *Stipa*. The way led over this tract of country until about 3 p.m., when I came to the *tambo*† of Gabriel Lopez, which is merely an open shed standing in the middle of a quagmire, on the edge of a clump of forest. An hour before reaching the *tambo* a tremendous storm of rain fell, so that ere my arrival I was drenched to the skin, without being able to change my clothing, for, as the *tambo* was without walls, the tempest swept furiously through it, and would have wetted me afresh even if I had put on dry clothing, which was more necessary for the following day. Shortly after reaching the *tambo* a party of soldiers, six in number, came to it from the eastward in a most exhausted state. They informed me that two of their companions had died from cold while passing the *parte peligroso* (dangerous part), and strongly advised me to return to Totoro, and remain there for three days until the tempest should calm down.

Next morning at daybreak the mules, five in number, were put in order, and I left on foot, keeping a few yards in advance of the muleteer, who was mounted, and who brought up the animals at a smart trot, while I busied myself in keeping ahead and in finding out the road, which in some places was a work of difficulty, from the abundance of long grass which covered the slopes and marshes that had to be traversed. The morning of this day broke through dense masses of dark fog, which was now succeeded by a tempest of wind and rain more fierce than that of the previous day.

After leaving the *tambo*, the way took a south-easterly direction over irregular rising ground for three hours, when, after passing through a patch of low stunted forest, I found myself at the base of an elevated platform of volcanic rock covered with loose stones, which is the "*parte peligroso*," the loftiest part of the road on the Guanacas. At this point I mounted, and in a few minutes the summit of the platform was reached, over which swept the cold wind and rain, and dark clouds of mist, with such violence that the animals were at times nearly brought to a standstill. Close on the right was seen a small lake (La Laguna) which might cover an acre of land,‡ to the southward of which runs a long range of snowy mountains that compose the volcano of Puracé, which is well termed by the Indians the "Crying Mountain." About 100 yards distant on the left rose a tall pyramidal hill, on the summit of which is another lake, of very small dimensions, of red water, which probably has some connection with the volcano. As I passed hastily along, I saw the bodies of the two soldiers who had died on the previous day, covered with large stones, and both sides of the road was thickly whitened with the bones of men and skeletons of horses and mules. Before I was half way across this platform the cold wind and rain produced the most alarming symptoms in the mules, and the one on which I was mounted

was

* "From Totoro begins a terrible ascent, in some places over steps in a corduroy road, the bones of numerous mules attesting its severity. The pass would be inaccessible for baggage-mules but for this corduroy road. Ulloa says that this, of all the South American passes, is the most famed and dreaded."—*Vigne*, ii. p. 248.

† Caldas thus describes the *paramo* of Guanacas:—"It is in 2° 30' N. lat., and, commencing at the town of La Plata, has a westerly direction. It is only 18 leagues long, but it takes seven days to go over them. It is necessary to cross the three rapid rivers of La Plata, Rio Negro, and Ullucos, and to ascend and descend precipitous mountains. I have myself crossed over this pass no less than seven times."—*Semanario de la Nueva Granada*, p. 25.—C. R. M.

‡ The Quichua word for an inn.—C. R. M.

§ "On the top of the pass there is a small lake, from each side of which flow tributary streams of the Cauca and the Magdalena."—*Vigne*.—C. R. M.

was rapidly becoming stiff, and refused to go on, when I called to the muleteer to bring my spurs. He replied that they were in the saddle bag, and that he could not take them out. On looking round I saw that he was almost powerless from the cold, although he was well covered up, and had on my long boots, while I travelled with a pair of sandals made of the fibre of *Agave americana*, which were already well soaked with water. On seeing the exhausted state of the muleteer, and that the mules refused to proceed, I dismounted, and told the muleteer to do so instantly also, and cut open the bag with his knife, and take out my spurs. The spurs were quickly got out, I sat down on a sepulchre to put them on, leaped from another on the back of the mule, and then with the spurs, and the point of a long knife, which the muleteer was directed to use also, the animals were brought to a gallop, and in a few minutes reached the descent on the eastern side. If I had been in London, I dare say I might have been fined for the treatment I gave to my mules, but the streets of London are not like the *paramo* of Guanacas; and so, by administering to the animals a little severe chastisement, I escaped from the deadly blast that swept over the "parte peligroso," where if the muleteer had remained five minutes longer, he would certainly have died. I was myself considerably frightened, and although I have crossed several of the loftiest passes in America, I would again prefer any of them to the pass of Guanacas. I was not able to determine the elevation, but I have little doubt that it does not exceed 14,000 feet. Why the atmosphere should prove so peculiarly destructive to human life at this elevation I cannot say, but it is surely something marvellous, for the edges of the lagoon are fringed with low stunted shrubs and stipas, and in clefts of rocks, beside a rivulet that comes from the lagoon, and which is the source of the river Paez, grow species belonging to familiar genera of cryptogams, lastreas, aspleniums, polystichums, lomarias, blechnums, and jamesonias.

The descent on the eastern side was the steepest I have ever seen, and the way for a considerable distance led along the side of a rushing torrent. On proceeding a short distance downwards, orchids were observed in great abundance, and lower down palms and tree-ferns were seen waving above the general forest. The road for the first two miles of the descent was irregularly paved with large stones, but on reaching the hot forest it is paved with trunks of trees, which are both difficult and dangerous to travel over, especially in steep places.

At about three in the afternoon I reached the "coral," which is an open spot on the banks of the Paez, almost entirely walled in by the most tremendous overhanging precipices I ever witnessed. Some idea of their height may be formed when I state that the summits are nearly as high as Guanacas, and appear as grassy *paramos*, while at the base of the precipices along which I travelled, grew palms and other tropical plants. On their lichened fronts, which were continually dropping water, hung selaginellas in long curtains, begonias, achimenes, orchids, and large bunches of lycopodiums. The Indians who cross the pass mostly sleep here for the night, but as the precipices looked as if about to tumble down, I was very glad to get away from under them, and proceeded to the next *tambo*, called La Ceja, which was about three leagues distant. I came to La Ceja about dusk, and found the *tambo* without inmates, but there was plenty of firewood, and, after changing my drenched clothing, a large fire was kindled, which the muleteer, with the remembrance of his recent starving on the *paramo*, continued to keep up until dawn of day.

On the 10th the march was resumed, when, after a number of ascents and descents in mud which reached to the knee, I came to the pass of the Rio Paez, which, from the number of auxiliary streams it receives before reaching this point, is a large foaming river, across which the mules had to swim, but I was obliged to crawl over the Indian bridge a little lower down, which was decidedly the most miserable structure of the kind I ever saw. It consisted of a network of climbers, stretched across the river, and fastened to trees that grew on projecting cliffs on each bank. There were no side cords or anything to hold by, which rendered it necessary to move with the utmost caution; nevertheless the passage is most unpleasant, for, as soon as one gets on to the apparatus, it begins to swing so much from one side to the other, that when the middle is reached the motion is violent enough to precipitate the traveller into the boiling
gulf

gulf below. About four in the afternoon I reached the village of Inza,* which is built on a little green table-land, on each side of which are deep ravines. The climate is hot, producing sugar-cane and plantains.

On the 11th I journeyed along the southern bank of the Rio Paez, over a grand picturesque country of lofty precipices of stratified rock, and deep ravines, most of which were dry or contained very little water. The strata in most instances was a slate rock, in a highly inclined or vertical position, whitened with lichens, but bare or thinly covered with soil, that, however, bore a number of very interesting plants, among which were observed several very beautiful *Malvaceous* shrubs and large flowered *Lælias*. The mountains seen on the right during this day's journey, run in a massive ridge eastward from Guanacas, and present the steepest slopes I have ever seen in any country. Existing as a lofty range of grass-covered conical elevations of vast extent, and mostly inaccessible even to the Indians, it appeared a matter of regret that such an extensive tract of country could never become available for the purposes of cultivation, or in fact for anything else. About five in the afternoon I halted at La Topa, which is merely a few houses, built at the confluence of three ravines, whose waters fall into the Rio Paez.

On the 13th I left La Topa, and journeyed for three hours along the edge of a precipice where there was scarcely room for the animals to tread, when the way came out on a wide plain or llano, on the eastern side of which is the city of La Plata, where I arrived about dusk. La Plata is scattered over a grassy plain on the southern bank of the river of La Plata.† The population is a mixed race of Spanish and Indian origin, and have their bodies marked with white and brown spots, which they attribute to the water. This, if true, seems very remarkable; for the adjacent hills and elevations are composed almost exclusively of limestone, which rarely deteriorates the water that rises from it. The disease alluded to appears to be a kind of leprosy, but, besides this, the inhabitants seem to be more generally affected by gangrene and cancer, than those of any other city through which I have yet travelled in South America. The plains and hill slopes around La Plata are burrowed by ants, which sadly perplex the Spanish Americans, who have not intelligence enough to devise a plan for their extermination.

On the 22d I left La Plata, the way leading round the base of a hill, and then sweeping round to the north-east, descended rapidly to the great valley of the Magdalena. Near the border of the plain is a small village called Peycol, where I remained for the night.

On the 23d I left Peycol, and traversed a wide savana, and then crossed the Paez by canoe, about eight miles below its junction with the river of La Plata. I had now fairly entered on the Magdalena valley, which here presented vast savanas, across which stretched a number of low hills, that run eastward from the Central Cordillera. However, even from the base of the low hills, extends a landscape diversified by irregular masses of black rock, that at a distance looks like a wild sea-shore at ebb tide, and this diversity of character sometimes reaches to the very bank of the Magdalena. After crossing the Paez the way led over an extensive plain, and then, turning a little to the northward, descended over a tract of broken country, ornamented by masses of rock, open green plains, lagoons, and patches of low forest of solanums, and leguminous plants. I saw some curious plants here, among them two species of leguminous trees, one of which was of weeping habit, and perfectly resembled a well-grown specimen of the weeping ash; the other had its bark irregularly blotched over with white patches about four inches square, and, at a distance, the deep green parts of the bark contrasted so strongly with the silvery white patches, as to remind me of the checkered squares of a chess-board. On the edges of the lagoons, I observed a species of *Equisetum*, which, although it grew in a situation where it could not be measured, was apparently not less than 16 feet high, and an inch and a half in diameter at the base. There were besides several species of juncus, and nymphaeas, and the trees adjacent to the lagoons were well loaded with orchids, such as *oncidiums*, *lælias*, and *odontoglossums*. On the whole I should

* "A small but very pretty village."—*Figura*, ii. p. 250.—C. R. M.

† "The situation is beautiful, with mountain slopes around."—*Figura* ii. p. 251.—C. R. M.

should have regarded this place as a kind of paradise, had it not been for the great abundance of tormenting insects, and snakes of an enormous length, which were seen everywhere in great numbers. The different species of insects, especially the various kinds of mosquitoes and ants, formed indeed a series of plagues, that prevented one from enjoying a moment of repose either day or night. It appeared wonderful how the ants, several species of which were of a very formidable nature, and which literally covered the ground as well as the trees, did not entirely consume the surrounding vegetation. When I wished to rest myself, I used to set the dried grass on fire; or if there was none, I made a fire of wood, and spread the hot ashes over the place where I intended to rest; but this plan always made the ground uncomfortably hot, although it was the only mode of keeping the ants and other troublesome insects at bay.

During this day's journey I had at no great distance on the Rio Paez, and on the left a wild black precipitous ridge of barren rocks, from the base of which issued many streamlets of water clear as crystal, a wonderful luxury, certainly, in the valley of the Magdalena. A halt was made as the day closed at the Angostura, a narrow opening in a low ridge of hills on the bank of the Rio Paez, which appears to have been the result of an earthquake, for the hill is rent asunder from top to bottom, and serves as a passage for travellers without encountering the difficulty of ascending or descending the ridge.

On the 24th I proceeded to the bank of the Magdalena, which I crossed by canoe at the Paso del Colegio, which is only about 50 yards below the junction of the Paez with the Magdalena. The Magdalena here was 120 yards broad, and contained a vast body of water, which run with arrowy swiftness. After some delay the march was continued along the eastern bank, over stony plains, scantily covered with herbage, which was completely burnt up by the excessive heat of the weather.

About five in the afternoon I reached the town of Lobo, which contains about 500 inhabitants who gain their living by washing gold dust on the banks of several adjacent streams which fall into the Magdalena. The gold is procurable in small quantities; an industrious washer can collect about one *castellano* (10 *s.*) in a week, but it is said to be of very superior quality, which is probable, as almost all gold collected on the banks of streams or rivers generally bears a high character.

On the 25th I departed from Lobo, the way leading across a most extensive plain, that runs along the eastern bank of the Magdalena almost all the way to Neyva, undiversified by anything excepting a few clumps of trees in damp places, and the river Neyva. About mid-day the river Neyva was crossed, the bed of which is full of quick-sands that are continually shifting, and thus render it one of the most dangerous passes in the valley.

About 6 p.m. I entered the town of Neyva, which is built on slightly elevated ground on the eastern bank of the Magdalena. It is a town of considerable extent and importance in several branches of commerce, the principal of which are gold dust, tobacco, cocoa, and Chinchona bark. The bark I found here comes from the forests of Lobo and La Union, and is the same as the coarse yellow bark of Pasto. Neyva exhibits the average amount of filth possessed by all South American cities, and besides the animal and vegetable refuse, which is always thrown out on the streets, large herds of swine traverse the principal squares, where they continue to torment from day to day the vendors of vegetables and fruits.

On the 28th I left Neyva, and came to Villa Vieja. The way led along the banks of the Magdalena, over dry stony plains, with a straggling forest of palms and leguminous trees in the damper hollows and on the banks of the rivulets. I reached Villa Vieja about dusk, but there was no herbage to be found for the mules, and so the march was continued until midnight, when on crossing the bed of a river which was dry, I lost the way, and in searching for it fell into a deep sand-hole which had formerly been a whirlpool; but after some exertion I succeeded in getting out, although considerably stunned by the fall. I remained in the bed of the river until the rising of the moon, when the path was discovered, and the march continued over dry stony plains until break of day, when I descended a steep gravel slope to the river of Cabrera. At this place, I halted for the day, which was absolutely necessary from the exhausted state

of

of the mules, which, owing to the long journey performed in such excessive heat, had suffered most severely.

On the 30th of August I crossed the Cabrera by canoe, and proceeded over dry plains, mostly destitute of vegetation, but covered with large black stones, which reflected the heat of the sun fearfully. This tract would have proved interesting to the geologist, on account of the number of fossil trees that lay scattered about on the road side. In a little hollow, that was not more than an acre in extent, I saw fossils enough to have loaded four or five waggons. Some of the trunks were 30 feet in length, and appeared to be dycotyledonous. About sunset I halted in the plains of Los Anjeles.

On the 31st I left Los Anjeles, and proceeded over dry hot plains for about four hours, when I entered a palm forest, which continued all the way to the Llanos of Purificacion, where I arrived about the close of the day.

September 1st.—I departed from Purificacion, and after an hour's journey again entered the palm forest, which was apparently of great extent, but there was nothing except palms, for they grew so thickly as to exclude every other plant. Late in the afternoon I crossed the river Prado by canoe, and put up for the night on its northern bank.*

On the morning of the 2nd the march was resumed, the palm forest still continuing, and at four o'clock in the afternoon I crossed the river of Fusagasuya by canoe, when a halt was made beneath the shade of a leguminous tree.

On the 3rd of September the march was continued, and after an hour's journey I emerged from the palm forest and travelled over low gravel hills for about two hours, when the way turned round to the north-east, and led down a steep slope to the river of Tocayma, or, as it is sometimes called, the river of Bogota. This river had also to be crossed by canoe, and then the path led up a steep slope along the edge of a ravine, where I remained for the night.

On the 4th I left Tocayma and ascended a number of steep slopes, which greatly fatigued the mules after such a long journey as they had undergone. About midnight I came to La Mesa, a town built on an elevated table-land of several miles in extent, but hot enough to produce sugar cane and plantains. At this place I halted, as the mules were tired, and could not possibly have proceeded farther without a few days' rest.

On the 14th I left La Mesa and ascended to the Boca de la Montaña. I was now in a cold climate, which strengthened the animals, but there was no herbage to be found anywhere, owing to the excessive dryness of the summer.

On the 16th of September I rose very early, and reached the summit of the ridge before day-break, when I unexpectedly emerged from the forest, and, looking to the eastward, beheld an extensive plain, about 800 feet lower than the crest of the ridge, large portions of which were covered with water; and as the sun arose above the distant ridge of blue hills to the eastward, which forms the western frontier of Venezuela, I descended over a series of dry mounds of sand and earth, on which grew many large specimens of *Cacetae*, to the "Savana," on the east side of which is built the city of Bogota. I was nearly half a day in crossing the Savana, and entered Bogota about five in the afternoon.

On the following morning I proceeded to the residence of Mr. Griffith, H. M. Consul-General at Bogota, and inquired whether any communication had been received concerning the collection, and was informed that no notice had been sent regarding it; but that a mail would arrive in a few days, which would probably bring the necessary order for dispatching the seeds. I waited on until the arrival of the mail, but no instructions came, and so I at once began to question the propriety of leaving such a valuable collection in the hands of the Consul-General, especially as he had previously told me that he had not heard anything about it.† From experience obtained during my former travels of matters in this way, I inferred that, as no explicit orders had been received by the Consul, the collection might be thrown aside until the vegetative power of the seeds was gone, or be put in certain places where from damp or other causes they might be destroyed. Besides, I was assured that, even if dispatched, the collection

* "At the river Prado the scenery is pretty, like that of Arcadia, as seen from the coast of the Adriatic."—*Vigne*, ii. p. 256.—C. R. M.

† The instructions arrived at Bogota on the 14th of October.—C. R. M.

collection would not reach England in less than two months. And as no instructions would arrive before 16 days more, on account of the paralyzed state of the native postage between Bogota and the sea-coast, I resolved to return as hastily as possible to Guayaquil, and dispatch the collection from thence to England. With this purpose in view, I left Bogota on the 22nd, and halted at the Boca de la Montaña, where I threw away everything weighty, including articles of clothing, in order to facilitate the march. I cannot at present give a detail of my disastrous return journey, which in itself would fill a bulky volume.

Notwithstanding innumerable obstacles, and the excessive temperature of the valley, I returned to the city of La Plata on the 11th of October. At this place I was informed of the war, which had been going on for about a month, between the republics of Ecuador and New Granada, and that all the passes to the southward were closed to every one. An urgent order had just come from Popayan to the authorities of La Plata for animals, and two of my best mules were forcibly taken from me for this service, by order of the presiding Alcalde. The Alcalde, however, did not send the mules for the order alluded to, but sent two other inferior animals, and retained mine, which were well trained riding mules, for his own special service. I mention this circumstance to show the peculiar sensibility of the Spanish Americans regarding their own interests.

I remained in La Plata until the 25th, when finding my efforts to recover the mules proved fruitless, I travelled on foot with the three remaining animals, which, being exhausted, carried only a few days' provisions, the seed bag, and empty saddles.

On the 28th I came to Inza, where I remained several days, until the bridge across the Paez had been replaced by another equally dangerous. During my stay at Inza, I procured specimens of a comparatively rare tree in New Granada, the Quino Quino, a species of *Myrospermum*.

On November 5th I left Inza, and again crossed the *paramo* of Guanacas, and came to Totoro on the 8th instant. Here I remained until the 15th to give the mules rest, as they had been much fatigued in crossing Guanacas.

On the 16th I entered Popayan, where I remained until the 21st, having previously intended to cross the western Cordillera to Tumaco, but on learning the difficulties likely to be encountered, I resolved to go on to Quito. Before leaving Popayan, I disposed of one mule, which was so much fatigued that it could not be expected to reach Pasto. The rains had just commenced, which rendered the roads almost impassable, but there was no time to be lost, for the Popayan Indians, to the number of 800 men, had received orders to leave for Pasto on the 22nd, where the New Granada army was engaged with the troops of Ecuador. The Indians when on a journey rob everything that comes in their way, therefore I resolved to keep ahead of them, and so left Popayan on the afternoon of the 21st, in company with 11 men, natives of Pasto, who had been in the Cauca valley on commercial business. Provisions were not to be found anywhere, indeed I may say that, almost all the time I was in New Granada, I experienced daily severe pinching of the common necessaries of life. At times even dried bullocks' hides were considered a grand luxury. The hide is cut in pieces, and placed on the hot ashes until it becomes nearly black, when this *Carbo animal* is beaten to a powder between two stones, and then put in soup, &c., as a kind of "seasoning." The thickest pieces of the hide are considered the best.

On the afternoon of the second day after leaving Popayan, notice was received from a running post that the Indians were encamped only two leagues behind, which caused us to march quickly on the third day, and we crossed the river of Patia about four in the afternoon. In less than an hour afterwards a fearful tempest of rain fortunately fell over the western slopes of the Cordillera Orientale, which caused the river of Patia to rise some six or eight feet above its ordinary level, and this circumstance prevented the Indians from crossing for eight days.

We proceeded slowly until Mercaderes was reached, where a halt was made about 50 yards from the village, under the shade of two large tamarind trees, which were at the time in full bloom. My companions procured some wood and water, and I was engaged in boiling a little coffee in a tin pot, when a woolly haired negro approached, and ordered us in a tone of authority to remain here or go back, as no travellers of any description were allowed to go to the southward.

ward. I replied that we would conform with the orders, but after dispatching the coffee, each one mounted his mule, and we rode off at a hard trot across the plain, a proceeding which the authorities of the village could not stop, as they had no animals to pursue us. After a four hours' run, each one was again travelling on foot, lest the mules should become tired, and day after day we travelled perseveringly up steep slopes of mud, or over slippery *travesias*, until the 5th of December, when a halt was made on the forest-covered mountains that bound Pasto to the north-east.

Early on the morning of the 6th, the march was continued, and we had begun the descent to the city of Pasto, when a heavy firing commenced near the city, and came up the slope which we were descending. On meeting the retreating party I resolved to diverge from the road, and accordingly struck along a narrow path where the ground was covered with tall shrubs, where I unsaddled my mules and left them to feed near an Indian hut, and picking up the seed bag and a blanket, I ascended a piece of rising ground, when I obtained a good view of the skirmishers. The retreating party numbered about 200, and the pursuers perhaps 150. A halt was made by both parties about 200 yards from where I was seated, and several volleys were exchanged with probably little effect, when the retreating party went off on the road to Popayan, and the others returned to Pasto. Some of the victorious party came to the Indian hut in quest of plunder, and took one of my mules, but the other fortunately escaped, being hidden by tall shrubs. With respect to New Granada, I must say that, although its northern shores are washed by the Atlantic, it is several degrees below the Ecuador in point of civilization. On reaching Pasto, I attempted to recover my lost mule, but was told by the governor that my request could not be complied with until the "question was settled." I removed with my remaining mule to the volcano of Pasto, where I gave it some time to recover its lost strength.

On the 16th of November I left Pasto, and encountered the usual amount of difficulty in passing through the several villages which were occupied by the troops of New Granada. On reaching Tulcan, I went to General Mosquera, and remonstrated with him concerning the loss of my mules, which were taken by the officers of his government. I got a kind of shuffling reply, but he gave me a passport for the generals in command of the army before Ibarra, which enabled me to pass the guards at the different stations without being detained until governors or others should be consulted. At length, after many difficulties, I reached Quito on the 31st of December. At Quito I delivered the bark taken from the suckers of the Chinchona tree in Pitayo, to my friend Dr. Jameson, who proposed to analyze it the first moment of spare time.

On the 1st of January I left Quito, and came to Hambato on the 3rd instant. Owing to excessive fatigue, and the scarcity of animals, for none were to be found anywhere except those employed in the service of the Government, I remained in Hambato until the 14th, and then prepared to cross the northern shoulder of Chimborazo. I slept for the night on the edge of the *paramo*, in a dense fog, and by daylight on the morning of the 15th I was nearly on the summit of the pass. When I was about to descend the western slopes a heavy storm of hail fell, which pretty nearly put an end to my only remaining mule. At length I came to Guaranda, where a halt was necessary on account of the fearful state of the roads. However with a few days' rest I proceeded slowly, knee deep in mud, and in some places to the waist. After a march of 10 days, I came to a place called Tambobamba, which is only about four hours' journey from the village of Caracol.

Notwithstanding all I had suffered during 10 days of perpetual rain, I was in good health, and resolved to proceed to Caracol, and get on board a small steamer there, which would take me to Guayaquil. The tract of country that lies between Tambobamba and Caracol, consists of low swampy land, covered with lofty canes of *Gynerium saccharoides*, that are interwoven with *Ipomæas* and other climbers. The road was represented by a narrow path two feet wide, and covered with water to a depth of four or five feet. I was told by a negro in Tambobamba that I could not go off the road, which in a certain sense was true, and so, although no guide could be procured, I determined to push onwards and reach Caracol before the arrival of the steamer. Just as I entered the *Gynerium* forest I plunged into a lagoon, which took me up to the waist, therefore I was obliged to prepare for any emergency, by cutting a long pole, with which I

sounded the road as I proceeded. I threw away my coat and boots, which, as they were of no use to me in the circumstances, rather retarded my progress. Thus I went on, carrying the seed bag on my head when wading the deeper lagoons, and carefully proving the bottom with the pole, until about four o'clock in the afternoon, when I suddenly came out of the forest, and saw the village of Caracol only about 100 yards distant. During my aquatic journey through the forest I was nearly devoured by mosquitoes, and the snakes congregated on each side of the narrow path in astonishing numbers. On entering Caracol I was told that no one had come from the interior for 15 days, and many wondered that I was not lost in the forest.

The following day I got on board the steamer, which proceeded directly to Guayaquil. On my arrival there, I at once went to the residence of F. Mocatta, Esq., H B M. Vice-Consul, and requested him to forward the collection to England, which he kindly undertook to do by the first mail, which would leave Guayaquil on the 14th or 15th of February.

I had left some dried specimens of the Pitayo Chinchona, and some very curious ferns, from the "parte peligroso" at Hambato, in order not to cumber myself, and because I had no way of protecting them from the elements.

In September I returned to Guayaquil with the dried specimens, intending to send them on to Mr. C. R. Markham; but on my arrival I found the city in a state of revolution, so that I was obliged to leave the specimens, and return to the interior, without being able to await the arrival of the steamer. If the seeds have not germinated, I will make another collection, and go down the Cauca valley to Carthagena, and dispatch them from thence to England. However, I may mention, that on sowing about a grain of the seeds here, several germinated, so that I have little doubt but that many thousands have been raised from the collection in India.

Reverting to my return journey, it will be observed that the state of the roads increased the difficulties very considerably, besides the fatigue induced by travelling on foot, from the city of La Plata to the plains of Guayaquil, in mud which very often reached to the knee; and fording rivers, which in the summer season are mostly dry, but which, whenever the rains commence, swell into fierce rushing torrents, and very often carry away both travellers and mules. The war going on between New Grenada and Ecuador also formed obstacles, that, combined with the loss of my mules, nearly frustrated the accomplishment of the work.

I was most severely reprimanded by Mr. Markham for not sending the collection from Bogota; but at this time, as at other periods, when employed in collecting seeds, or in travelling in charge of Chinchona plants from equatorial America to India, I executed everything faithfully and to the very best of my judgment and ability. If any error was committed the injury fell on myself, for, owing to the vast tract of country which had to be traversed in a time of revolution, with bad roads, and vicissitudes and hardships of every kind, my expenses amounted to within a mere fraction of twice the sum I stipulated for the work, namely 150 £.

Some time ago I received a note from my kind friend Professor Jameson, stating that he had analysed the Pitayo bark brought from the locality from whence the seeds were taken, and that he found it to contain 3.2 per cent. of quinine. I have therefore little doubt that this species, and the *Chinchona officinalis* of Loxa, will prove among the best for cultivation. The climate is like that of Loxa, and even the vegetation of both regions bears a close resemblance to each other.

The Andes of South America—at least so far as I have travelled over them, from the southward of Loxa to the city of Santa Fé de Bogota,—present great diversities of character, and even each particular tract of country possesses its own peculiar and distinctive features. Around Loxa many of the mountain ridges appear as if they had been scraped from top to bottom, and they are separated by profoundly deep ravines, on whose naked and almost perpendicular sides grow only a few stunted cactæ and agaves. To the south-west of the valley of Catamayo, dry rainless deserts extend to the frontier of Peru. However, on passing to the northward of Assuay, the mountainous regions are covered with a dense vegetation, and above the forest limit are extensive grassy *paramos*, while higher still rise rounded elevations, or conical peaks, covered with

with perpetual snow. Beyond Pasto the loftier regions bear an aborescent vegetation; but the hot, low-lying plains are mostly covered with coarse grass, or low-spreading *Leguminosæ*. From this point until one reaches the great valley of the Magdalena, the mountainous region presents a most savage aspect of stupendous precipices, which form a kind of wall along the base of the eastern and central Andes. Throughout this vast territory, but especially along the course of the central Andes, runs a long line of burning mountains, active spouts of hot mineral water and sulphurous vapour, and bubbling mud volcanos.

I have, &c.

(signed) *Robert Cross.*

P.S.—There may be some points concerning the habit and growth of the Chinchona trees in this region, which I have omitted here; but, if so, those in charge of the plantations should write to me respecting anything which may require further explanation. In a second report, part of which is already written, I intend to describe more minutely the Chinchona regions of Loxa and New Granada.

R. C.

Paramo of Ancamarca,
Northern Slopes of Chimborazo,
10 December 1864.

— III. —

CHINCHONA CULTIVATION IN WYNAAD, COORG, ON THE
PULNEY HILLS, AND IN TRAVANCORE.

— No. 1. —

CORRESPONDENCE on the subject of Chinchona Cultivation in Wynaad.

From *G. A. Ballard*, Esq., Collector of Malabar, to Secretary, Board of Revenue.

Sir,

Calicut, 27 June 1864.

THE past season has been one of unusual sickness in Wynaad, and the great sufferings of the people have impressed me very strongly with the urgent necessity of taking all possible steps to alleviate the disastrous effects of future sickly seasons, which in all probability will occasionally recur. I believe the natives have no effective remedy for fever. It is most important to put one within their reach.

2. I do not know that this can be better done than by taking active steps to spread the Chinchona, not only in a few large plantations, but widely in the gardens and small holdings of the people.

3. The generosity of the native agriculturalists can hardly be expected to go to the expense of purchasing Chinchona plants, especially at this early stage, whilst the cultivation is partly experimental; but they undoubtedly are sufficiently alive to the immense importance of raising anything that will tend to ward off or alleviate fever to give attention to the culture of plants distributed to them.

4. I beg, therefore, that a supply of 500 plants in a suitable state of growth may be sanctioned from the Government Chinchona gardens, and that a sum of 150 rupees may be allowed for the cost of baskets, coolie hire, &c. required for distribution.

Can be met from the sum of 1,000 rupees provided for "Other Items" under "I. Land Revenue, Miscellaneous," in the Budget of 1864-65.

5. Every care will be taken to distribute the young plants pretty evenly through the talooks, and as far as may be to select persons who will do them justice. Lists will be kept of the recipients, and all endeavours used by the officials to excite and keep up interest in the cultivation.

6. I advocate the gratuitous distribution now purely from a sanitary point of view. But I may add, that from the experiments already made in Wynaad, there seems no reason to doubt the success of Chinchona cultivation there, which may be looked upon as already established in one or two estates.

7. I believe, if what I have proposed is sanctioned, a great benefit will be conferred on Wynaad, and if, as I hope, Government are pleased to allow the plants I beg early orders, so that they may be disseminated during the rains.

ORDER of the Board of Revenue.

1. Ordered to be submitted for the favourable consideration of Government.
2. The case is altogether exceptional.

— No. 2. —

ORDER of the Madras Government, 27 July 1864.

1. IN his letter submitted with the foregoing proceedings, the collector of Malabar, referring to the occasional prevalence of fever in Wynaad, applies for a supply of 500 Chinchona plants for gratuitous distribution among native agriculturalists in that talook, who, that officer observes "can hardly be expected to go to the expense of purchasing the same."

2. The Government see no reason why Wynaad alone should be thus treated. It is not the only tract in which fever prevails, and is certainly richer than other feverish tracts. The price of Chinchonas, moreover, is extremely small, and when obtained by purchase there is some assurance that endeavours will be made for their being duly cared for; but were the plants distributed gratuitously, as now suggested, it is to be feared that if not neglected they would be destroyed by being stripped of their leaves and bark on occasions of attacks of fever. Mr. Ballard's proposal does not therefore seem expedient, and the Government must decline to accede to it.

— No. 3. —

From *Clements R. Markham*, Esq., to the Secretary to Government, Revenue Department, Fort St. George.

Bangalore, 7 February 1866.

1. WITH reference to para. 40 of my letter to your address, dated 16 January 1866, I beg in continuation to submit my conclusions respecting Chinchona cultivation in Wynaad, after a personal inspection of every part of that district.

2. Along the ridge of western ghauts overlooking Malabar, several grand masses of forest-covered mountain rise from the Wynaad plateau, and terminate in well-defined peaks at elevations of from 4,500 to 5,000 feet. The most remarkable of these mountain knots are the Velerymulla, the Chumbra, the Koocha-mulla, and the Balasore ranges, while the Bramabgherry mountains form the boundary of Northern Wynaad. The sites best adapted for Chinchona cultivation are to be found along the more sheltered slopes of these ranges.

3. The

3. The present state of the undertaking, as regards Wynaad, is not so advanced as I had hoped, and this slow progress is due to the practice of charging money for the plants, a large per-centage of which die on the transit, instead of distributing widely and without stint. Good progress has, however, been made on a few estates, and several planters fully intend to give the cultivation a fair trial.

4. The estates where chinchona plants are now growing are as follows:— There are a few in the Ouchterlony Valley, and on the plantations of the Moyaar Coffee Company. On the Naikenshola estate, in Cherambody, Mr. Minchin has a nursery containing about 50 plants of *C. succirubra*, two or three feet high, as well as several trees planted out, one of which is six feet high and five inches in girth. On two estates, called the Ellembellora and Panora Peaks, on the slopes of the Chumbra Hills, several trees are growing most satisfactorily. The Ellembellora Peak estate, belonging to Mr. Hinde, has an elevation of 3,500 feet, with a western aspect. Seven trees were planted out in February 1864, and they now look very healthy, with leaves untouched by the land wind. They are of the *C. succirubra* and *C. micrantha* species, and average a height of five to six feet, and a girth of five to seven inches. Mr. Hinde expects a cooly load of plants from the Neilgherries in a few days, and he intends to form a plantation on the slopes of the Chumbra mountain, above his estate, at an elevation of about 4,500 feet. The Panora estate is at the northern end of the Chumbra range. Mr. Rossell, the owner, planted out several chinchona trees in December 1863, at an elevation of 3,600 feet above the sea. Not a single drop of rain fell for three months after they were planted, and there are now 12 trees of *C. succirubra* and three of *C. micrantha* planted out, of which three of the former are cuttings struck on the estate. Their height is from five to seven feet, and girth six to seven inches. These two estates, as well as those of Rimington, on the other face of the Chumbra Hills, are admirably adapted for chinchona cultivation, and I look forward to very satisfactory results from the future operations of their owners. On the Anapara estate, at the foot of the Chumbras, Mr. Ferguson has a fine healthy tree. It is worthy of observation that the rainfall on these estates varies exactly as their aspects vary on the slopes of the Chumbra Hills, with reference to the south-west monsoon. The following is a register of the rainfall kept on the two estates where chinchona trees are growing:—

RAINFALL on the Slopes of the Chumbra Hills (Wynaad).

Month.	Panora Peak Estate.			Ellembellora Peak Estate.		
	1863.	1864.	1865.	1863.	1864.	1865.
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
January - - -	1.14	0.00	0.00	- - -	- - -	0.00
February - - -	0.02	0.00	0.00	- - -	- - -	1.83
March - - -	5.43	0.00	0.72	- - -	- - -	0.45
April - - -	7.49	7.16	5.08	- - -	4.49	7.41
May - - -	5.53	5.30	7.98	- - -	8.44	9.37
June - - -	50.66	39.28	22.54	- - -	40.49	26.30
July - - -	35.84	54.68	79.60	- - -	69.39	97.98
August - - -	36.42	12.67	21.59	- - -	16.47	25.78
September - - -	7.00	7.77	5.42	- - -	10.02	5.41
October - - -	10.43	2.32	4.88	- - -	5.90	7.47
November - - -	1.14	1.60	4.77	- - -	0.78	4.62
December - - -	1.19	0.45	0.75	- - -	0.26	0.76

At Baliapara, on the Koocha-mulla range, there are several plants; and Mr. Richardson has a row planted, in hard gravelly soil, in front of the Cutcherry at Manantoddy. Finally, there are nine very fine healthy plants of *C. succirubra* on the estate of the Bramahgherry Hills, belonging to the Madras Coffee Company.

5. An estate of 300 acres, on the well-wooded hills above the Tirunelly Pagoda, has been applied for by Mr. Lowry, a planter and an excellent gardener, exclusively for chinchona cultivation. Mr. H. Gordon, who is opening

largely on the Bramahgherries and in the Tirunelly valley, has sent for 1,000 plants. Mr. Beaumont, the managing director of the South Indian Coffee Company, intends to form an experimental plantation at the foot of the Velery-mulla range, on the top and round the sides of a hill called Padapara. The plantation will cover about twenty acres, and will be sheltered partially from the south-west monsoon by the Velery-mullas, which tower above it. In short, there now seems to be a prospect of a considerable extension of chinchona cultivation in Wynaad, and, while it will be remunerative to the planters, there will hereafter be supplies of bark for their labourers, growing on the spot. I beg, therefore, to suggest that Mr. Richardson, the deputy collector, be supplied with all reports and proceedings on the subject of chinchona cultivation, and especially with one of the copies of Mr. Howard's work ("Nueva Quinologia de Pavon"), so that there may be the means of reference for cultivators in Wynaad.

6. But, although the extension of this cultivation on the estates of European planters is much to be desired, it is far more important that the natives of the district should be induced to open small chinchona gardens in every direction, and in great numbers. The people suffer fearfully from fever. The scourge has appeared exceptionally early this season, and I have myself witnessed its ravages, while I am assured that later in the year the scenes even on the public roads are loathsome and heartrending. Much of this fearful evil might easily be mitigated.

7. The Chetties, Nairs, and Moplals, who occupy land in Wynaad, generally select elevated knolls for the sites of their dwellings, which are exceedingly picturesque. They are covered with jacks, mangoes, bastard sago palms, and plantains, and overlook the rich paddy cultivation in the flats below. In most of these sites chinchona trees would grow well, and form another item in the garden produce of the people. The healing febrifuge would be at their doors, and the use of the bark would be extended to hundreds of slaves and coolies who now die and rot on the public roads for the want of it. The machinery for carrying out this beneficent measure is at hand. The deputy collector will gladly superintend its details, distribute plants, select the best persons as recipients, explain the importance of the measure, and endeavour to excite an interest in the cultivation. The experiment will cost little or nothing, while the good that may be derived from it is evident. An unspeakable blessing, such as only those who have witnessed the ravages of fever amongst the coolies can fully appreciate, will be conferred on the Wynaad district.

8. I venture, therefore, to recommend this measure most strongly to the favourable consideration of the Governor in Council. In the first instance, about 500 strong young chinchona plants should be supplied to the deputy collector at Manantoddy, and a small sum should be sanctioned for the cost of cooly hire, tools, and the preparation of a nursery. He would then be in a position to propagate and distribute plants, and to take all such measures as, in his judgment, will be most conducive to the great object in view.

I have, &c.
(signed) Clements R. Markham.

— No. 4. —

REPORT of an Analysis of Bark of *Chinchona succirubra* grown in Wynaad.
By J. E. Howard, Esq.

THE analysis was made of about a quarter of a pound of bark of *C. succirubra* grown in the Naiken-shola estate, at Cherambody, in S. E. Wynaad, by Mr. Minchin. The plant from which it was taken was planted in April 1863, at an elevation of about 3,000 feet above the sea. It was six inches high when planted, and when cut down in December, 1864, it measured 7 feet 3½ inches in girth near the ground.

The analysis gave 5.4 grains of oxalate of quinine, or 1.20 per cent. The crystallizations of the rough oxalate were 2.20 per cent.; but Mr. Howard was not satisfied with this, and by re-crystallization and conversion into sulphate of quinine, subsequently obtained 1.20 per cent. There was besides 0.8 of chinchonidine,

nidine, and 0·2 of chinchonine, making a total yield of 2·20 per cent. of febrifuge alkaloids. There is a loss in such delicate operations on a small scale, and besides the result above stated, there was some uncrystallized quinine which, in large quantities of bark to work, might be made available.

Mr. Howard considered this analysis to be very promising, and that with care, and especially by *mossing* the Wynaad barks might be made very productive: The analysis showed a bark likely to rival the very best from South America.

— No. 5. —

EXTRACT of a REPORT from *C. Soobiah*, Native Assistant to the Superintendent of Coorg, to the Chief Commissioner of Mysore.

26 January 1866.

THE Government chinchona plantation in Coorg is near Mercara, on the ghaut leading to Fraserpett. The chinchona trees were planted on 24th August 1863, when there were 96 plants, about three inches high.

In August 1864, it was found that seven had died; in January 1866, 19 more had died. The total of deaths was 26. In their room eight had been planted, two on 16th November 1865, and six on 23rd January 1866.

The plants are in pits filled in with ashes and soil, three feet deep. They rooted well in the rainy season, when they were planted, but afterwards suffered from want of moisture in the dry weather. In the dry season of 1865-66, they have been watered every evening; and have derived benefit from the process. For the first six months the plants were protected from the sun by artificial shade.

The plants have put forth primaries, beginning at nine inches from the ground, up to three feet. The girth of the stems is 9½ inches. Four plants have flowered this year. One was 10 feet 3 inches high on 26th January 1866.

NUMBER of Chinchona Plants in the Government Plantation in Coorg on January 1866.

Planted in August 1863	-	-	-	-	-	-	-	96
Died since	-	-	-	-	-	-	-	26
								70
Replanted	-	-	-	-	-	-	-	8
								78
Remaining in January 1866	-	-	-	-	-	-	-	78

A good many plants have been sold to private persons. There are 75 on the Yemnagoondy estate, belonging to Rev. G. Richter; 70 on the Cuthelay Cadoo estate, belonging to Captain Taylor; and 20 on the Hallegrynaad estate, belonging to Mr. Mangles. Mr. Richter's and Captain Taylor's are very healthy and promising; but those on the estate of Mr. Mangles are not doing so well, being much exposed to the wind. The plants bought by natives have all died from want of proper treatment.

— No. 6. —

From Mr. *Clements K. Markham* to the Under Secretary of State for India.

Chinchona Cultivation in Travancore and on the Pulney Hills.

Sir,

Neilgherry Hills, 26 December 1865.

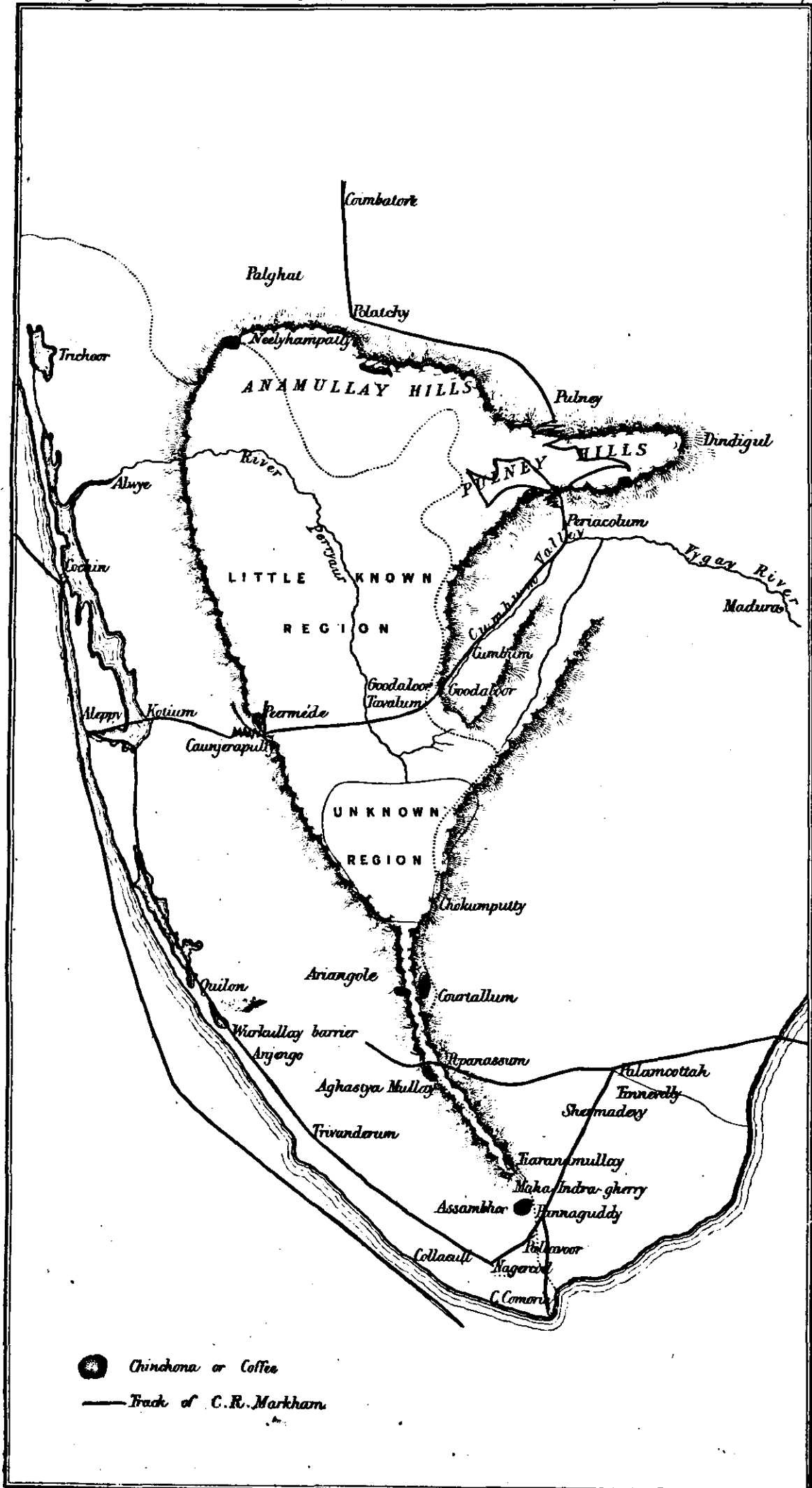
I HAVE the honour to report my proceedings from the date of my letter written at Tuticorin to my arrival on these Hills, during which time I have been engaged in examining portions of the mountain range between Palghat and Cape Comorin, with a view to the selection of sites for chinchona cultivation. The spread of this cultivation throughout the hills of India, by means of numerous

centres of propagation, is, in my view, essential to the success of the principal object for which the experiment was undertaken, and I therefore believe that the results of my recent journeys will prove useful. I shall enter fully on the general question in my report to the Madras Government, a copy of which I shall shortly have the honour of transmitting for the information of the Secretary of State in Council. I now propose to report the particulars of my journeys in the hills of Travancore and of the Madura district.

2. Considerable progress has recently been made in planting on the southern ghauts, and the establishment of coffee and tea estates will always lead to the cultivation of chinchonæ. The natives are fully alive to the importance of introducing the quinine-yielding trees. The Dewan Peshkar of the southern division of Travancore, with whom I had a long conversation at Pannaguddy, asked me for chinchona seeds; and, in subsequent conversations with the Rajah of Travancore, at Trivanderum, and with the Dewan Madava Row, I found that considerable interest was already taken in this measure. Mr. Newill, the Resident, thought it desirable that I should visit Peerméde and the neighbouring hill district, with a view to suggesting the course that should be followed by the Travancore Government with reference to chinchona cultivation; and I considered it to be my duty to accede to his wishes. I had the great advantage of the company of Dr. Cleghorn, the Conservator of Madras Forests, during this expedition. My travelling expenses to Peerméde were defrayed by the Travancore Sirkar.

3. The mountains from Palghat to Cape Comorin may be divided into two distinct regions, for the purposes of description, which are separated from each other by that extensive unknown tract of country, where the sources of the great river Perryaur are still concealed from our knowledge. The southern region extends from Cape Comorin to Courtallum, and comprises the mountain chain which divides Travancore from Tinnevelly. Near Cape Comorin, isolated masses of weather-beaten rock rise abruptly from the plain, and form an outline of battlements and pinnacles against the sky; and the continuous range only commences north of the Aramboly Pass, where the mountains attain a height of 3,000 feet and upwards. The range is not broad, and has little or no intermediate table land, but slopes abruptly from the summit ridge to the rich green expanse of Travancore on one side, and to the dried-up plain of Tinnevelly on the other. The peaks rise to a height of 6,000 feet. Several coffee estates have already been formed on these hills. The most southern are at Assambhoo, at an elevation of 3,000 feet, immediately above the Aramboly Pass. General Cullen, who was Resident from 1840 to 1860, originally formed a coffee garden at Assambhoo, which is now owned, in partnership, by the first Prince of Travancore and the Dewan. But, within the last few years, the Rev. J. Cox, a missionary, a Mr. Gordon, and two planters from Ceylon (Messrs. J. and J. C. Grant) have opened coffee estates at Assambhoo, with every prospect of success. The principal drawback to this site is its exposure to severe gales of wind, which do much injury to the plants. Further north, and on the Tinnevelly side, at the feet of those grand precipices called Maha-Indra-gherry and Tiranamullay, there is a small coffee estate, owned by a wealthy and liberal-minded Mohammedan, named Meer Anjemir, who lives at Pannaguddy. At the foot of the peak of the Aghastya-mullay, in Travancore, a fine tract of forest land has been purchased, but not yet cleared, by General Sim. On the Tinnevelly side, in the forests near Popanassum, 500 acres have been granted to Mr. Barter, of Tuticorin. This estate, which has not yet been surveyed, is on the Vellar river, and 50 yards of jungle are to be reserved on each side of the stream. Messrs. Cocq, of Tuticorin, have long had coffee estates near Courtallum, which are now managed by Mr. Crabbe; and Messrs. Binny, of Madras, have tea, cacao, and spice gardens, under the management of Mr. Liddell, of Quilon, in the Arriangole Pass, at an elevation of only 1,200 feet above the sea. There are other clearings of minor importance.

4. There is a notable difference between the climate on either side of these ghauts. On the west side the slopes are abundantly watered by the south-west monsoon, and the streams fall into the backwater, supplying the narrow slip of land with water in abundance. On these Travancore hills clearing may be carried on to any extent, without detriment to the low country, which could well dispense with some of its surplus moisture. But, on the east side, the due supply of water for the tanks and channels is a necessary of life to the



the people inhabiting the wide plains of Tinnevely. Indiscriminate felling on these eastern slopes would lead to most deplorable results, and the evil is already beginning to be felt. Further grants of land have been prohibited in the Tenkassy Taluq, and in Nanganary the people complain bitterly of the drying up of the streams. There can be no doubt that serious consequences will arise from indiscriminate felling; but, when 1,84,000 rupees are required for the repair of tanks and channels in Tinnevely, and only 48,000 rupees are granted, the failure of water cannot be entirely due to a reduction in the rainfall caused by clearing on the hills.

5. Chinchona plants, on a more or less efficient scale, will be hereafter cultivated on all the coffee clearings and other lands that I have enumerated, and it should be remembered that their beautiful foliage will be even more effectual in wringing moisture out of the passing clouds than the original jungle. The natives are well acquainted with the value of quinine; and when the trees which yield it are growing round the base of that magnificent peak, 6,000 feet above the sea, that is dedicated to their great Rishi and physician, Aghastya, they will fully appreciate the blessing that has thus been brought to their doors. Severe gales of wind cause the chief difficulty in commencing cultivation on these mountains, especially on the exposed slopes of the Aghastya-mullay, but the chinchona trees, when they once get through the first two or three years of their growth, will not suffer irreparable damage from this cause.

6. I now come to the northern division of the mountainous region extending from Palghat to Cape Comorin. It includes the Anamallay and Pulney hills, in British territory, and an extensive hill district within the native states of Cochin and Travancore, and differs from the southern division in possessing several ridges with wide stretches of table land, instead of a single line of mountains sloping directly from their summits to the plains on either side. The Travancore portion of this region is by far the most extensive, but until quite lately no attempt had been made to open cultivation on it, and the southern part is still entirely unknown. Mr. Maltby, in 1862, formed a small garden at Peerméde, on the western verge of the Travancore mountains, and several coffee planters have since settled in its neighbourhood. Their pioneer was Mr. Munro, and he it was who made the road to the foot of the ghaut for the Travancore Sirkar. The road commences at Kotuim, on the Cochin backwater, and passes over undulating country, covered with forest, to the foot of the mountains at Mundakayum, a distance of 33 miles. For this distance a good bandy road has been completed and bridged throughout. At Mundahayum there is a large river, Kullapoliem, where a good stone bridge is in progress, and here the ascent of a ghaut commences, which is quite equal in beauty to that of Sispara. The road up the ghaut is not completed, and extensive blasting operations are necessary, but large gangs of coolies were at work, and rapid progress was being made. The coolies were getting four annas a day (an ordinary labourer's pay in the plains being two annas), and for boring rock they are paid by the foot. They get four annas a foot, and can do three feet a day, but are not paid unless their labour results in a good blast.

7. At the top of the forest-covered mountains is the region called Peerméde, a country of grassy slopes, splendid forest land, rocky ridges, and lofty peaks, averaging an elevation of 3,000 feet above the sea. At its western edge, whence there is a glorious view of the 30 miles of forest as far as the backwaters and the sea, Mr. Maltby, who was then Resident of Travancore and Cochin, built a house, which he called Maryville, and established a chinchona garden for the Travancore Government. This was in 1862.

8. The rajah granted 1,000 rupees for a garden and a glass house, 300 rupees for getting chinchona plants from the Neilgherries, and 40 rupees a month for a gardener and coolies; and, in December 1861, Mr. Maltby wrote a most interesting memorandum on the subject: "The garden," he then said, "may be viewed as formed to aid in the introduction into the mountainous country of Travancore of the chinchona plant, and its other objects may be considered as subordinate to this, such as the growth of tea, coffee, &c. The question is, how the Travancore Government can most successfully second the efforts of the British Government, and make due use of its mountain region in extending chinchona cultivation. There are mountains near Maryville on which subsidiary plantations may be formed up to nearly 6,000 feet. Extensive seed beds should be formed, and there should be about 10 acres of

coffee. By selling the seedlings to planters, at a yield of half a ton an acre, the profit would probably cover the cost of the garden. Tea should be raised in the same way, and the towns on the coast might be supplied with potatoes and onions. The Maryville garden was commenced by planting apples, pears, grapes, oranges, strawberries, raspberries, roses, geraniums, fuchsias, &c., and kitchen vegetables."

9. On 11th December 1861 the four first chinchona trees were planted by Mr. Maltby at Maryville; a *C. Peruviana* in the north-east corner, a *C. succirubra* in the south-east, a *C. nitida* in the south-west, and a *C. micrantha* in the north-west. But his admirable suggestions have been very inefficiently followed out since ill-health unfortunately obliged him to retire in 1862. Mr. Newill, the present Resident, furnished us with the following memorandum, dated December 1865: "The Government garden at Peermede was established about three years ago. In March 1863 about 500 chinchona plants were brought from Ootacamund by Mr. Hannay, the superintendent of the Sirkar garden. They were then about two months old, and from one to two inches high. Many died when quite young, from the effects of damp, drought, or cutting winds. There are now about 220 strong and healthy plants, and some 200 young plants have been propagated. The *C. officinalis* has a tendency to throw out branches along the ground, like a creeper. The tea plants are now three or four feet high, and seeding freely.

"So far the experiment has been encouraging, and it seems desirable for the Sirkar to pursue it, so far as to provide the means for planters to try it on a more extensive scale, though I question the expediency of the Sirkar entering into extended operations, which may be left to the enterprise of others.

CHINCHONA PLANTS, at Peermede, December 1865.

	Name of Species.	Number.	Average Height.		Height of Tallest.	
			Ft.	In.	Ft.	In.
Age 2 years and 10 months.	<i>C. succirubra</i>	79	5	0	8	6
	<i>C. micrantha</i>	46	3	6	6	0
	<i>C. Peruviana</i>	27	3	0	6	0
	<i>C. nitida</i>	13	2	6	3	0
	<i>C. officinalis</i>	60	2	6	4	7
	TOTAL	225				

10. I found the plants at Maryville looking vigorous and healthy, although the leaves and some of the branches had suffered severely from the cutting land winds of the north-east monsoon. The site is not, I think, the best that could have been chosen. It is exposed to the whole force of the land wind, as well as to the south-west monsoon, yet the plants may be successfully propagated here, and, if the plantation is extended, there is a well-sheltered sholah to the south-east. The elevation above the sea is 3,300 feet, and the temperature is suitable. The rainfall, according to observations made for General Cullen, varies from 125 inches on the western skirts to 40 inches on the eastern crests of the ghauts. The girth, close to the ground, of the largest *C. succirubra* tree was 9 inches. There were 225 chinchona plants, exclusive of cuttings, 5,000 coffee and 4,000 tea seedlings. With regard to the establishment, I found that Mr. Hannay, the superintendent, received 120 rupees a month, a blacksmith 15 rupees, a carpenter 14 rupees, a maistry 12 rupees, and 11 coolies 7 rupees each; making 238 rupees a month, or about 285 £ a year. There is no regular allowance for the garden, and no glass house has yet been completed.

11. We have reported our impression, and submitted various recommendations respecting this garden, and generally on chinchona cultivation in these hills, to Mr. Newill, for the consideration of the Travancore Government. The Maryville garden should be the source of supply whence chinchona plants should be forwarded to every part of the Travancore hills, as opportunities for the cultivation may arise. With this view the expenditure might well be raised to 500 £ a year; a gardener might be procured, trees might be cultivated for seeds, and propagation might be extensively carried on; and the garden should be

be self-supporting, through the sale of coffee and tea seedlings, and of kitchen vegetables. The cultivation of *C. officinalis* should be given up, the elevation being insufficient, and attention should be turned entirely to the spread of *C. succirubra*, *Calisya*, and *micrantha*. This measure, originated by Mr. Maltby will, if properly and systematically carried out, be a great blessing to the people, and highly creditable to the Travancore Government.

12. The coffee estates, the first of which was only commenced in 1862, are from a mile to four miles north-east of the Maryville garden, and are rapidly taking the place of the beautiful natural sholahs. They are at present six in number, and the extent of country taken up, cleared, and planted, will be seen at a glance in the following Table :

COFFEE ESTATES, &c., at Peerméde, on the Travancore Ghauts.

Name of Estate.	Owners.	Managers.	Acres.			Remarks.
			Grant.	Cleared.	Planted.	
1. Maryville - -	Travancore Government -	Mr. Hannay -	-	-	-	Chinchona plantation.
2. Hope - - -	Originally owned by Mr. Monro, now by a company.	Mr. G. Baker -	500	300	150	Commenced in 1862. The felling has been too extensive, and sufficient attention has not been paid to weeding.
3. Woodlands and Keppoch.	Originally owned by General Stevenson, now by four partners: 1. General Stevenson. 2. Mr. Crawford, commercial agent at Aleppy. 3. M. Aspinall, of Cochin. 4. Mr. Oughterson.	Mr. Oughterson Mr. Stevenson, assistant.	500	140	110	Commenced in 1862.
4. Ashley - - -	Dr. Petman - - -	Dr. Petman -	200	100	60	Commenced in 1863.
5. Stagbrook - -	Mr. Robert Baker - -	Mr. R. Baker -	200	30	30	Commenced in 1863.
6. Fairfield - -	Mr. Henry Clarke - - Dr. R. Clarke.	Mr. Henry Clarke	900	15	-	Mr. Clarke has only recently commenced felling.
7. Twyford - - -	Mr. Richardson - - - Rev. H. Baker, missionary.	Mr. Richardson -	600	40	40	Commenced in 1864.
8. Wullungum-canum sholah, containing 1,400 acres.	Mr. Crawford, commercial agent at Aleppy.	- - -	500	-	-	Felling not yet commenced.
9. Messrs. Pierce, Leslie & Co., of Cochin, and a Mr. Berry.	- - -	- - -	-	-	-	A grant of about two square miles.

13. All the country occupied by these coffee planters is well adapted for Chinchona cultivation, and I was glad to find that they were inclined to undertake it. The tract fitted for coffee extends from the crest of the ghauts to a range of hills about three or four miles further to the eastward, and for many miles to the north and south. The country is intersected by well-wooded ranges of hills, occasionally running up into fine peaks, such as Amarithamullay, overlooking the low country, which is 4,700 feet above the sea; the Anaconum Peak, overhanging the Woodlands estate; and several others not marked on the trigonometrical survey, but which will be found on the accompanying map. The scenery is exceedingly beautiful. The undulating hills are covered with tufts of lemon and elephant grass (*Andropogon*), growing to a height of six or eight feet, and the valleys and mountain sides are clothed with fine sholahs. Unlike the comparatively stunted stems and umbrella-like foliage of the Neilgherry and Pulney hills, the trees in the Peerméde sholahs, at a lower elevation, grow to a great height, and present a grand appearance. The undergrowth beneath them consists of cardamom, wild ginger, zedoary, rattan, a small bamboo, called eetah by the natives, and a few ferns. The following are the principal trees: the Parl-murum (*Isonandra acuminata*), a large tree only recently discovered by General Cullen, much used for planking; the Nanga, called

called by the planters "iron wood," appears to be a sort of poou; Anjelia (*Artocarpus hirsutus*), yielding a very valuable timber; Aranili, a tree of the jack tribe, from the bark of which bags are made; *Terminalia catappa*, or Indian almond; *Erythrina Indica*, at the edges of the sholahs; wild cinnamon; two species of *Eugenia*, and some other Myrtacæ; two kinds of *Garcinia* or gamboge trees; and the *Canarium strictum*, or black dammer tree, called by the natives *Congilium-marum*. Besides the eugenias, there are several other beautiful flowering shrubs outside the sholahs, but still under the shade of their trees, such as *osbeckia*, *crotalaria*, and the brilliant dark blue *torenia*, so common on the Sispara ghaut. These fine sholahs, with their valuable timber, are fast disappearing under the axe of the planters, and the loud crash of falling trees is constantly heard on the hill sides. The sites best adapted for chinchona planting are the forest slopes beneath the peaks called the Tumbys, and within Mr. Clarke's estate. They are well sheltered from the cutting land winds, and partially so from the south-west monsoon, while the numerous mountain streams supply abundance of water. It is, I am happy to say, the intention both of Mr. Clarke and Mr. Oughterson to undertake chinchona cultivation.

14. A telegram from Mr. Levinge, the collector of Madura, induced us to undertake an expedition from Peerméde across the mountains, by a very unfrequented route, to the Madura district. I considered it desirable to take this line, both because it would enable me to judge of the country across the whole width of the Travancore ghauts, and because I should thus have an opportunity of consulting Mr. Levinge on the important subject of chinchona cultivation on the Pulneys.

15. A reference to the map (Sheet No. 62), will show that there is a very extensive mountain region between the plains of Travancore and those of Madura. The southern portion, extending over an area of about 30 miles by 20, out of which issues the river Perryaur, is entirely unknown, and is a blank on the map. The northern part borders on the Anamallays, and is almost as little known. The great river Perryaur, flowing from south to north, traverses the centre of this mountain region, and, after a long course, eventually turns to the west, and falls into the Cochin backwater. Our route passed right over this country, crossing the Perryaur. The mountains are owned, under the Travancore Government, by the petty Rajah of Pooniat, and from time immemorial there has been a track called the Pooniat road, traversing Peerméde and passing down into the Cumbum Valley on the Madura side. It was used by the elephant hunters, whose old pits are still to be seen, and by the Pooniat rajahs' cardamom gatherers. The ancient Pandyon kings of Madura are said to have received their supplies of betel, pepper, and cardamoms by this route, in exchange for rice and cloth. At present the Madura people annually drive their herds up to these mountains for pasturage, but the only inhabitants are a wild tribe of wandering hill people called Uralas. They are seldom seen.

16. The distance from Peerméde to the Perryaur river is 7½ miles on the map, 10 miles by our route; from the Perryaur to the eastern crest of the ghauts, 5½ miles on the map, 8 by our route; from the crest of the ghauts to Goodaloo, on the Madura side, 8 miles on the map, 12 miles by our route. A total distance of 30 miles on foot, over a most difficult country.

17. The road leads from Peerméde across grassy uplands, with much rock on the surface, to the river Urraday, whose affluents water the Hope and Woodlands estates, and crosses the stream at the Urraday Tavalum. These tavalums frequently occur on the map. They are merely places where herdsmen are in the habit of resting their bullocks, and are known by several acres being overgrown by a species of composita (*Blumea*), the result of bullock manure. The land must be very rich and valuable. There are several magnificent sholahs on the hills overhanging the Urraday, and facing to the westward; but after crossing them, the country to the eastward presents a hotter and drier appearance, the sholahs are smaller, there are large patches of eeta bamboo in them, indicative of a poor soil, and they often only extend a few yards on either side of the streams. We saw several bison on high hills to the south, sambar bounded before us into the sholahs, and there were numerous traces of elephants and cheetahs. The country appears never to have been entered by a shikar. We passed through the Pambanur (snake) tavalum, and over hills covered with grass 10 and 12 feet high, a most blinding and tedious march, and finally came, by a steep descent, through bamboo jungle, to the banks of the Perryaur.

18. Although

18. Although this was nearly the lowest season, the river was 30 yards across, and we found by the marks that, during the monsoon, it rises eight feet higher. The whole of this immense volume of water now runs to waste in the Cochin backwater. But there has long been a project to throw a dam across, at a point 13 miles south of where we crossed, and to make a cutting, so as to throw the river over into the Madura district. The details of this project and its former history are so interesting, and of such great importance, that I have embodied them in a separate memorandum, which I herewith enclose. It will probably be useful, as the subject must, sooner or later, be brought before the Secretary of State in Council.

19. The coffee plantations have already begun to attract traffic over this formerly unfrequented route; and before long, a good bullock track, and a bridge over the Perryaur, will become an urgent requirement of the district. The rice and cloths of Madura will be exchanged for the silver of the planters and the betel, cardamoms, and tobacco of Travancore. We found 200 bullocks on the banks of the Perryaur, laden with rice for the coffee plantations, coming from the Cumbum valley. The bullocks were driven in, and made to swim across, while the bags of rice were ferried across on a rude bamboo raft; a process which seemed likely to occupy at least 24 hours. One only has to be a witness of proceedings such as this, to be deeply impressed with the delay and injury caused by the absence of bridges. We crossed the river on the same bamboo raft, but the coolies with our tent did not arrive until late, having been driven or rather frightened off the road by a herd of wild elephants. The river is here lined on both sides with clumps of bamboo; the bed is very rocky, and the water clear and cool. As night closed in, the fires of the herdsmen and the mass of white bullocks under the bamboos were finely reflected in the river. Fires throughout the night were necessary, to keep off the tigers which abound in extraordinary numbers, denoting the great abundance of other kinds of game.

20. After passing up the bamboo jungle which fringes the river on the east side, we entered upon a country presenting a still more dried-up appearance, though the grass was still of immense height. Stunted trees were scattered over the open hills, chiefly *Terminalia coriacea*, and here we met with the first teak trees. The land is formed into a large amphitheatre of hills, with two sharp peaks, and after descending the slopes, we entered a thick bamboo jungle, and had to wade along the bed of a torrent up to our knees for a considerable distance. The woods abound in black monkeys with white beards, jungle fowl, and imperial pigeons. The Goodaloor tavalum is an open space in the midst of the forest, about 5½ miles from the Perryaur, and close to the crest of the eastern side of the ghauts. The descent into the Cumbum valley is rapid and precipitous, over huge boulders of *ark*; and often crossing a mountain torrent. The ghaut is clothed with splendid forest trees. Black wood (*Dalbergia latifolia*), one of which I measured 4 feet from the ground, and found to be 17 feet in girth, and another was at least of equal size; vengay trees (*Pterocarpus marsupium*), yielding excellent wood for building purposes, as well as the gum, kind of commerce; a tree called locally vekali (*Conocarpus latifolius*), the wood of which is also used for building; the black dammer tree; and lower down, great quantities of the loathsome *Sterculia foetida*, which yields an inferior kind of poon spar. Here and there we got peeps of the rich Cumbum valley as we descended, with mountains on the opposite side. On first coming out into the valley, there is a wide stretch of open grass land dotted with the yerikum bush (*Calotropis gigantea*), where immense herds of cattle were feeding, and further on there are fields of castor oil, and fine crops of toor and raggee. The shade in the upper part of the valley is afforded by the umbrella thorn (*Acacia platifrons*), the *Euphorbia pentagona*, growing like a tree, and the Palestine thorn (*Parkinsonia aculeata*). Lower down the valley, the road is shaded by banyans and tamarinds. I have described the irrigation of the Cumbum valley, and touched upon the subject of making a road thence to Peermédie in the accompanying memorandum on the Perryaur; and I need only add here that, on reaching Periacolum, where the cholera was raging, we went up to the Pulney hills without delay, by the Periacolum ghaut.

21. My examination of this route convinced me that the country eastward of Peerméde was unsuited for chinchona cultivation, although I think it probable that, if the dense forests round the sources and upper course of the Perryaur are ever partially cleared, good sites will be found for the growth of the red and grey barks.

22. Mr. Levinge obtained 12 chinchona plants from Ootacamund in March 1864, and they were planted in his garden at Kodakarnal on the Pulneys, in the following April; they were then two or three inches high. The site is well sheltered, with a north-west aspect, and the land was originally not sholah, but common grass land; about two feet of mould, below which there is large-stoned gravel, and below that, red clay. Holes were dug well through the gravel, and the earth was mixed with a little manure, in which the trees were planted, nine feet apart each way. The site is 6,985 feet above the sea. On 18th December 1865, the state and condition of these trees was as follows:—

CHINCHONA TREES at Kodakarnal, on the Pulney Hills, December 1865.

Species.	Height.		Girth of Stem.	REMARKS.
	Ft.	in.	Inches.	
<i>C. succirubra</i> , No. 1	4	9	7	The largest leaf was 11×7 inches.
" " 2	4	9	6	
" " 3	5	2	4½	Three large shoots rising from the stem.
" " 4	8	10	5½	
" " 5	-	-	-	Numerous shoots springing from the stem.
" " 6	1	9	-	Sickly.
<i>C. officinalis</i> , No. 1	4	8	5½	Shoots on the stem. Tree covered with buds.
" " 2	5	0	5	Covered with buds and flowers. Many shoots on the stem.
" " 3	4	5	4½	Fine healthy tree.
<i>C. micrantha</i> , No. 1	4	1	6½	Stem divided into two near the ground.
" " 2	-	-	-	Sickly. Broken down by an accident.
" " 3	3	3	4½	Sickly. Died down, and shot up again.

23. I have already described the Pulney hills, and have recorded my opinion, as to their capacity for chinchona cultivation, both in my former Report and more fully in my work. My present visit has not induced me to alter the views which I then formed. As the trees of *C. micrantha* were drooping, I recommended that they should be transplanted to the Kodakarnal sholah, near a stream where tree ferns flourish. I have also supplied Mr. Levinge with a parcel of seeds of the *C. officinalis*, procured from Ceylon. This species will, no doubt, thrive well on the Upper Pulneys, as will also *C. Pitayensis*, the seeds of which have just arrived at Ootacamund. *C. succirubra* should be introduced into the Lower Pulneys, where, however, very little progress has been made in coffee planting. The climate is too dry, and there is much fever. Mr. Spershneider, formerly in the Forest Department, has about 40 acres of coffee on the Lower Pulneys, at a place called Pali-mullay. M. Fontclerc, a Frenchman, has a small coffee garden, and a short time ago Mr. Coyle, a missionary, had another. The native villages are generally on round knolls, with fine jack and mango trees, surrounded by terraced cultivation, garlic, onions, potatoes, vendiam (fenugreek), and some coffee. They are exceedingly picturesque, but are well within the fever zone, and every house should have a few trees of the healing chinchona near it. The difficulty is to find machinery for the spread of the cultivation. A collector, who takes an interest in the work, can do much; an intelligent subordinate in the Forest Department still more. On the Pulneys we now have a good beginning, and every prospect of satisfactory progress. There are the means of propagating, to any extent, in Mr. Levinge's nursery, and suitable sites for cultivation abound. I rode over a portion of the higher Pulneys, where there are several sholahs of considerable extent, with northern aspects, at an elevation of 6,000 feet, which are well protected from the strong winds of both monsoons, while they receive all the moisture that reaches the hills. We selected one, as the best of all, in the direction of Manavanoor, which covers about 150 acres. I have since written fully to Mr. Levinge on the whole subject.

subject. On leaving the Pulneys we passed by the villages of Vilputhy and Pullanky, crossed the heights of Talla-mulla, and down a precipitous and rocky pass on foot, to the village of Pulney.

24. It only remains to say a few words respecting the Anamallays, which I regret to say I could not spare time to visit, though I enjoyed a grand view of them from Polatchy. Here there is an unlimited area for future planting; every species of chinchona will flourish at the different altitudes, from 7,000 to 3,000 feet, and in few places will the blessing of the presence be more felt than in the neighbouring districts. The native hospital at Polatchy, within 10 miles of the Anamallays, the beneficial effects of which already extend to all the fever districts at the foot of the hills, will hereafter receive unlimited supplies of bark, and have the febrifuge manufactured on the spot. All this is in the future, yet a commencement has already been made in planting the Anamallays. Mr. Macdonald Ritchie, and his agent and partner, Mr. Lowrie, have opened a plantation on a very large scale, in the Ponachy valley, their grant including several thousand acres; and besides proceeding rapidly with the clearing, Mr. Lowrie is making a road up the ghaut at his own expense. A Mr. Nisbett and a Mr. Lees, agent to the Carnatic Coffee Company, with whom I understand that Messrs. Arbuthnot, of Madras, are connected, are also opening estates on the Anamallays, and a wealthy native, named Rama Swamy Modeliar, who owns extensive property at the foot of the hills, has long had coffee gardens higher up the Toracudda valley. At Nelliampatty, in Cochin, about 20 miles south-west of Palghat, there are also five coffee estates. I have now passed in review the whole of the clearings from Cape Comorin to Palghat, and I have no doubt that, though primarily made for coffee or tea cultivation, they will all necessarily lead to the extension of chinchona cultivation, and thus in furthering the beneficent intention of the febrifuge plants, prove a permanent blessing to Southern India.

25. From Pulney and Polatchy I have made the best of my way to the Neilgherry hills, where I have since been incessantly engaged in inspecting the plantations, and in considering the important questions which now arise in connection with chinchona cultivation. When I submit the results of my investigations to the Madras Government, I shall at the same time transmit a copy to your address, for the information of the Secretary of State in Council, in which the practical conclusions at which I have arrived during my recent journeys above reported, will appear.

26. I have the honour to submit the following enclosures:—

1. An additional Memorandum on the subject of immigration to Ceylon.
2. A Memorandum on Madura irrigation and the Perryaur project.
3. A Memorandum on public works connected with the Travancore backwaters.

P. S.—I have materials for a map of the Perryaur region, with many new names of peaks and rivers, fixed by cross bearings, and two observations, at Peerméde and Cumbum, for true bearing; and also for a plan of the Wurunkullay barrier; but I regret that I have not yet had time to put them on paper, so as to transmit them with the enclosures.

— No. 7. —

From Dr. *Cleghorn*, the Conservator of Forests, to the Secretary to Government, Revenue Department, Fort St. George.

Madras, 6 February 1866.

1. I BEG to submit, for the information of his Excellency in Council, copy of a Memorandum on the Government garden at Peermade, Travancore, which was drawn up at the request of Mr. Newill, the resident.

2. Mr. Newill informs me that his Highness the Rajah has approved of the recommendations generally, and steps are being taken to secure the services of a skilled superintendent from Europe.

MEMORANDUM on the Government Garden at Peermade.

1. The proposal to establish a Government garden upon the Travancore Ghâts, for the introduction generally into that mountainous tract of useful and ornamental plants, as tea, coffee, vanilla, &c., but more especially for the naturalization of the chinchona tree, originated with Mr. F. N. Maltby, the late Resident, and was in every respect an admirable one.

2. Mr. Maltby, in his Memorandum dated 23d December 1861, considered that Peermade, or rather the new station called "Mary Ville," on the proposed line of road from Alleppey to Madura, and 47 miles distant from Kotiam, afforded suitable advantages. It is healthy, open to the sea breeze, with an elevation of 3,300 feet above the sea, and enjoys a temperate climate; the adjoining district presents a remarkable variety of soil and scenery. Between it and the Perryár River, is an undulating plateau, where forests alternate with grass lands, affording fine pasture for cattle.

3. Near Peermade, on the same range of mountains, appropriate sites may be found, up to an elevation of near 6,000 feet, where subsidiary plantations might be formed to suit the different species of chinchona.

4. The rain-fall, according to the observations of General Cullen, who kept a register for a long series of years, varies from 40 inches on the eastern ghâts to 125 inches in the western slopes, diminishing towards Cape Comorin; while the thermometric register of Mr. Maltby at Peermade in December 1861, shows that the mercury fell to 58° Fah. in the early morning, and rose to 74° Fah. at 2 P.M. in the shade. Farther observations with maximum and minimum thermometers would be very valuable.

5. To carry out Mr. Maltby's project, his Highness the Rajah of Travancore sanctioned the following sums:—

1,000 rupees for the garden and glass house.

300 " for plants and seeds from the Neilgherries.

40 " monthly for gardeners and coolies, with the promise of a suitable grant for seeds and plants as required. These sums were applied to the preliminary works in 1862. In March 1863, about 500 chinchona plants, two months old, and from one to two inches high, were brought from Ootacamund by Mr. Hannay, the superintendent of the garden, but more than half were lost, some in transit, and others soon after arrival from the effects of exposure to drought, damp or cutting winds, as the glass house was not ready for their reception.

6. I visited Peermade, in company with Mr. Markham, in December 1865, and remained two days. Although Mr. Maltby's scheme has not been followed out in detail, it is satisfactory to record that the Travancore Sircar has well seconded the efforts of the British Government, and that the result of the chinchona experiment is more successful here than anywhere else in Southern India, excepting on the Neilgherries. The accompanying Table gives the age and height of the plants at the date of our visit.

PEERMADE Chinchona Nursery, December 1865.

Names of Plants.	Number.	Height.	Age.	Height of Tallest Tree.
		Ft. in.	Yrs. m.	Ft. in.
Chinchona succirubra	79	5 0	2 10	8 6
" micrantha	45	3 6	2 10	6 0
" Peruviana	27	3 0	2 10	6 0
" nitida	7	2 6	2 10	3 0
" officinalis	60	2 6	2 10	4 7
" Unknown	6		2 10	3 6
	225			

About 200 were also raised from layers and cuttings.

7. The girth of several of the largest of the *C. succirubra* was nine inches close to the ground, and their height for their age was generally satisfactory; some

some of the plants had been broken by the violence of the wind, but were in a healthy state, throwing out strong shoots from the seat of injury. The chinchonas planted in the shola behind the Sircar bungalow had suffered comparatively little from the wind.*

8. The species that thrive best are *C. succirubra* and *C. micrantha*, but *C. Calisaya* should be tried. The *C. Condaminea* (or *officinalis*) is evidently planted at too low an elevation, being weak and delicate, with a tendency to throw out branches along the ground.

9. The Peermade garden has a southern exposure, and receives the full burst of the south-west monsoon, from the violence of which all the plants above the size of dwarf shrubs have suffered in some degree; but as the Government have in view the dissemination of seeds and seedlings rather than the formation of a large plantation, it does not seem advisable to change the site, particularly as a glass house and superintendent's cottage have been already built; the present nursery, however, might be sheltered by planting screens of Australian acacias,† or other quick growing trees, and the garden might be extended in the shola behind, which is sheltered from the prevailing winds.

10. The experiment of chinchona introduction having been thus far successful, it is now desirable that the Travancore Sircar should furnish the means of extended culture to the planters of this rising settlement, and to the neighbouring ranges of hills, as opportunities may arise; I therefore beg to suggest that 12 grown plants of *C. succirubra* be at once given to each of the planters, who are ready and desirous of commencing chinchona culture; and thereafter as many young plants of this and other species as may be available, to applicants at the old Neilgherry rate, viz., four annas per single plant.

11. I would also suggest that a certain number, say 200, of each of the following species,—

Chinchona succirubra; *Chinchona Calisaya*; *Chinchona micrantha*;

should be carefully planted in the shola behind "Mary Villa," or other sheltered slope and a careful record of their growth be registered.

12. The superintendent, Mr. Hannay, is an energetic man, accustomed to an Australian life, and skilled in mechanical appliances, but without special horticultural knowledge; his attention has been sometimes diverted to forest operations, and other works, to the prejudice of his duties in the garden; the importance of propagating extensively, by layers and cuttings, should be kept in view, and for this purpose, the small experimental plantation, mentioned in paragraph 11, should be formed with great care and attention.

13. There does not appear to be any fixed establishment; the monthly expenditure at present is—

	Rs.	a.	p.
Pay of the superintendent	120	—	—
Ditto - garden maistry	10	—	—
Ditto - six gardeners at Rs. 7. 8. each	45	—	—
Ditto - six coolies at Rs. 6. 8. each	39	—	—
Ditto - two peons at Rs. 5 each	10	—	—
Ditto - cooly maistry	15	—	—
Ditto - blacksmith	9	—	—
Ditto - carpenter	14	—	—
Ditto - Malayalum writer	8	—	—
Ditto - bullock driver	14	—	—
TOTAL	Rs.	284	—

= Rs. 3,408, or £. 340. 16 s. a year, and with the objects in view, perhaps the expenditure might be raised to £. 500 a year, which is the sum set aside in Ceylon. If a like sum could be sanctioned in Travancore, the services of a skilled and practical horticulturist could be secured.

14. *Yea.*—

* Note.—It should be remembered that though shelter is highly advantageous, the plants should not be overshadowed or exposed to the drip of other trees.—See Mr. Melvor's Reports.

† Note.—*Acacia lophantha*, a fast grower, and not affected by drought, is most useful for protecting plantations. Seeds of this species and of *A. Melanoxylon* and *Mollissima* have been despatched to Mr. Hannay.

The *Cassia florida*, which flourishes so well at Bangalore, is hardy, and a fast grower. It should also be tried, as a thick interlaced screen might quickly be formed; directions will be given for the transmission of seed.

14. *Tea*.—The Neilgherry seed received in 1861 germinated freely, and there are now about 70 well formed bushes from two to four feet high in flower and fruit, 400 seedlings are available, and a large seed-bed has been prepared, and when the garden stock is sufficient, the seeds and seedlings should be distributed gratuitously, or sold at a moderate rate, such as would afford a fair profit to intending speculators, who would establish nurseries on their own account; the primary object being to disseminate selected seeds from the best grown varieties to all desirous of cultivating tea. The Neilgherry rates of one rupee per pound of seed, and 10 rupees per 1,000 seedlings might be adopted.

15. With regard to the quality of Travancore tea, nothing definite can be said until the leaf has been subjected to skilful manipulation; but it may be mentioned that Mr. Liddell, of Binny & Co., has shown me reports from professional brokers of London and Calcutta valuing tea, grown at Charter's Hope, in the Ariangole Pass (elevation 1,200 feet), at four shillings per pound.

16. It appears to be highly probable that this part of Travancore is well suited for tea culture, and therefore at least four acres of the Government garden should be planted with tea, to furnish seed of the best quality, as much disappointment has been experienced by Mr. Hannay and several of the planters in attempting to raise seed imported from Assam and the North West Provinces, the vitality of which had been lost in transit.

17. Coffee nurseries have been prepared on all the estates, so that unless it be for the convenience of planters, or for the self-maintenance of the garden, the coffee shrub need not be propagated.

18. *Vanilla*.—It seems doubtful whether this plant will thrive at Peermade; it has been grown, but has not flowered. Further experiments in sheltered sites are required, as the commercial value of the pod is great, with an increasing trade in Ceylon.

19. The tallow tree of China and Mauritius (*Stillingia sibefera*) which is cultivated in China and in the northern Provinces of India along with tea, might also be tried, for which purpose a few fresh seeds have been sent to Mr. Hannay. The varnish tree of China (*Elæococcus vernicifera*) might also be tried.

20. *Vegetables*.—Potatoes, onions and other kitchen vegetables, and rhubarb, might be grown to any extent for the supply of Quilon, Alleppey, Cochin and Trevandrum. Potatoes are sold at Ootacamund at 1½ rupees per maund, but are not delivered at Trevandrum for less than three rupees, and the supply is irregular.

21. *Fruits*.—Apples, pears and grapes have been tried, but do not thrive on the crest of the ghâts. In some of the valleys, oranges would do well; raspberries and strawberries were in fruit at the time of my visit. The mangostein has ripened at Courtallum, and might succeed here in a well-selected site.

22. **SUMMARY**.—To recapitulate, it seems desirable that attention should be specially given to the careful cultivation of chinchona and tea; extensive seed-beds should be formed, and ten acres of the former and four of the latter might be planted out. This would probably be sufficient to keep the chinchona nurseries amply supplied, and to furnish fresh tea seeds and seedlings for a fair extent of cultivation. Vanilla, potatoes and other products mentioned, should receive due care from the superintendent. Cotton does not appear to thrive, and might be excluded for the present.

23. *Superintendent*.—Having been requested to suggest the means best calculated to increase the utility of the garden, I have no hesitation in recommending that a skilled superintendent be procured from one of the best gardens in Europe, on a salary of (say) 150 rupees a month, with a residence. The object in view is to improve the culture of indigenous productions, at the same time to naturalize chinchona, tea, and other useful exotics, and to prepare both for distribution to the other settlements in these beautiful hills and plains. For this, horticultural skill and ability are essential requirements, meanwhile Mr. Hannay (whose services might be transferred to another department) should,

should, with a trained native gardener, propagate chinchona and tea to the best of his ability.

The following are the principal Trees found in the Sholas adjoining Peermade, observed during a hasty excursion.

No.	English Names.	Native Names.	Botanical Names.
1	- - - -	Palmaram - -	Bassia elliptica (Dalzell) or Isonandra acuminata.
2	Iron wood - -	Nauga - -	Mesua ferrea.
3	Anjelle - -	Angill, Ayence - -	Artocarpus hirsuta.
4	Sack tree - -	Araya Anjelly - -	Antiaris saccidora.
5	Gamboge - -	Mukki - -	Garcinia pictoria.
6	- - - -	- - - -	" " Kydü.
7	Rose apple - -	- - - -	Jambosa Munronü.
8	Indian plum - -	Narvelli - -	Syzygium.
9	Wild cinnamon - -	Darchini - -	Cinnamomum iners.
10	- - - -	- - - -	Litsea Zeylanica.
11	- - - -	- - - -	Machilus macrantha.
12	Black dammer - -	Congiliam maram.	Canarium strictum.
13	- - - -	Vellay naga	Conocarpus latifolius (known as Dinduca in Mysore).
14	- - - -	- - - -	Elæcarpus serratus.
15	Black wood - -	Eti maram - -	Dalbergia latifolia.
16	Ben-teak - -	Ben-teak - -	Lagerstrœmia microcarpa.

Nos. 2, 3, 11, 13, 14, 15 and 16 yield excellent timber; black wood is found sparingly in the western, but abundantly on the eastern slopes.

Among the shrubs and herbaceous plants which especially attracted notice, were the following:—

- Melastoma - - - - Torenja cordifolia (Sispara creeper).
- Osbeckia - - - - Cœsilpinia (two species).
- Urena - - - - Crotalaria (two kinds).
- Solanum giganteum - - - - Exacum bicolor (Chiretta).
- Erigeron (Coffee weed) - - - - Ophelia (vary) ditto.
- Blumea - - - - Andrographis paniculata (Creyat).
- Smithia.
- Impatiens (several species) and of the Scitamineous tribe, there are wild Cardamom, Ginger, Zedoary.
- Hedychium and Phrynium dichotomum.

ORDER of the Madras Government, 21st February 1866:

MR. McIVOR will afford every assistance sought by the Resident in the way of furnishing his Highness the Maha Rajah with seeds and plants, and giving his Highness's employes facilities for becoming acquainted with the propagation and culture of the chinchona.

(signed) J. D. Sim,
Secretary to Government.

— IV. —

CHINCHONA CULTIVATION IN BRITISH SIKKIM.

— No. 1. —

FIRST ANNUAL REPORT on Chinchona Cultivation in British Sikkim from 1st April 1862 to 30th April 1863, by *T. Anderson*, Esq., M. D., Officiating Superintendent of the Botanic Gardens, Calcutta.

THE progress of the cultivation of the chinchona at Darjeeling under my direction was fully reported to the Lieutenant Governor of Bengal on the 6th August 1862, and the report was published in the supplement to the "Calcutta Gazette."

That report contained the history of the experiment from the despatch of the plants from Calcutta on the 24th March 1862 until the 1st August. In that report, I stated that the experiment might be considered as having commenced on the 1st of June, as from unavoidable delays in a district where carriage of all kinds was most difficult to procure, where skilled labour was scarce and extravagantly expensive, and where even the ordinary processes of gardening were quite unknown, I was obliged to keep the chinchona plants confined for two months in Wardian cases, some of them having been already subjected to five months of this confinement. The total number of plants with which the experiment was commenced on the 1st June was 211. On the 1st of August the number had increased to 1,611 of all kinds, of which, however, it is deserving of note that 1,300 were newly raised seedlings of *Chinchona Pahudiana*. In the end of August, Mr. Stubbs, the European gardener, who had accompanied the plants from Calcutta in March, suffered so much from continued illness of a serious nature, that I directed Mr. A. T. Jaffrey, who had just been appointed assistant gardener of the botanic gardens in Calcutta, to proceed at once to Darjeeling to receive charge of the cultivation from Mr. Stubbs, whom I intended, on his recovery, to recommend for appointment to the charge of planting the avenue of mahogany and other trees along the Ganges and Darjeeling road. Mr. Stubbs, however, died on the 26th September at Kursiong, where he had gone for change of air. Mr. Jaffrey received charge of the experiment on the 13th September. I again submitted a report on the 12th November, in which it was shown that the total number of plants in the nursery was 2,286, of which, however, 1,921 belonged to the doubtfully quiniferous species, *C. Pahudiana*, so largely cultivated by the Dutch in Java, leaving only 365 plants as the stock of the undoubtedly valuable species of chinchona. I made a visit of inspection to the chinchona nursery at Darjeeling in January. I left Calcutta on the 18th January, and returned to Calcutta on the 1st February. I then saw that my fears, that the height of Sinchal above the sea and the cold of the winter would seriously affect the condition of the plants, had been confirmed. Though there had been few deaths (not more than 50 of all species), yet the situation was so unfavourable that almost no cuttings or layers had been made since November. This was partly owing also to an untoward accident having happened to the flue in one of the two small propagating pits. The upper part of the flue immediately over the furnace had fallen in suddenly, causing the house to be filled with hot air and smoke, and doing great damage to the plants before the fire could be extinguished, and the plants removed to the other propagating house.

In January I had also an interview with Captain Fitzgerald, the executive engineer, under whose directions the road leading to the permanent site of the chinchona nursery was being made. He informed me that the difficulties he had met with in the opening out of this road were so great that the buildings and clearing of the forest could not be commenced until the road was finished,

and were not likely to be completed until April 1864 at the soonest. On learning this, I immediately endeavoured to obtain temporary occupation of a site, with a dwelling-house for the European gardener, at an elevation of 6,000 feet above the sea, and 2,500 lower than the temporary buildings at Sinchal. After I left Darjeeling, I procured the occupation for one year of a garden and dwelling-house at Lebong, a warm, well-sheltered spur below Darjeeling, at an elevation of 6,000 feet above the sea. The plants and all the stores were removed from the temporary buildings at Sinchal to this site in the first week of April. Although the distance was seven miles, the arrangements were so carefully made by Mr. Jaffrey, who personally superintended the removal of the plants, that only one plant of *Chinchona succirubra* was slightly damaged. The number of plants brought from Sinchal to Lebong on the 1st April were as follows :—

RETURN of Chinchona Plants in the Nurseries at Darjeeling on the 31st March 1863.

NAMES OF SPECIES.	Remaining on 31st October.	Remaining on 31st March.	REMARKS.
<i>C. succirubra</i> - - - -	213	323	
<i>C. Calisaya</i> - - - -	25	30	
<i>C. nitida</i> - - - -	61	100	
<i>C. micrantha</i> - - - -	51	80	
<i>C. Peruviana</i> - - - -	8	18	
<i>C. Condaminea</i> - - - -	None	31	
<i>C. Pahudiana</i> - - - -	1,921	1,892	The produce of 11 plants of this species brought from Ceylon on 28th January.
<i>C. species without name</i> - - - -	7	10	
TOTAL - - - -	2,286	2,489	

When the highly unfavourable circumstances under which the plants were placed are remembered, along with the fact that the propagation of *C. Pahudiana* had been entirely discontinued, the progress shown in this report is satisfactory enough; for the best species, those which it is my object to increase as rapidly as consistent with the healthy condition of the plant, had been increased from 365 on the 31st October, to 592 on the 31st March. On the 1st April, 327 plants belonging to the following species of chinchona were added to the stock at Darjeeling. These plants were obtained from Madras on the 31st January 1863; and of the original number, 350, received from Madras, only 23 had been lost between Calcutta and Darjeeling during the two months that had intervened from the date of their arrival in Calcutta, and their reaching Darjeeling. The numbers received are as follows :—

RETURN of Chinchona Plants received at Darjeeling, including those from Madras, on the 1st April 1863.

NAMES OF SPECIES.	Number of Plants received from Madras on 1st April.	Old Stock existing at Darjeeling on 1st April 1863.	Total Number of Plants at Darjeeling on 1st April 1863.
<i>C. succirubra</i> - - - -	97	323	420
<i>C. Calisaya</i> - - - -	21	30	51
<i>C. nitida</i> - - - -	44	100	144
<i>C. micrantha</i> - - - -	48	80	128
<i>C. Peruviana</i> - - - -	23	18	41
<i>C. Condaminea</i> - - - -	94	31	125
<i>C. Pahudiana</i> - - - -	None.	1,892	1,892
<i>C. species without name</i> - - - -	None.	10	10
TOTAL - - - -	327	1,484	2,811

Before concluding this general report on the experiment of cultivating chinchona in Bengal during the past official year, it seems to me that, in order to form an opinion of the comparatively great success that has attended the operations, a short recapitulation of the difficulties experienced at Darjeeling is necessary.

1st. I laboured under the disadvantage, last year, of being quite ignorant of the nature of the country of British Sikhim, beyond what I could learn from the accounts of Dr. Hooker, as well as from the collections of dried plants from Sikhim which exist in the Calcutta herbarium. I had formed very inadequate ideas of the difficulty of reaching Darjeeling, of the condition of the roads leading to it, and of the resources of the station as regards labour, especially such skilled labour as I required, such as native gardeners, carpenters, and masons. I also supposed that no difficulty would be experienced in obtaining abundance of land, the property of Government, in the neighbourhood of Darjeeling; that glass for the conservatory, and flowerpots, &c., could be procured in Darjeeling. Some idea, however, will be obtained of the difficulties with which the experiment had to contend when I state that no suitable Government land could be got nearer than 12 miles from the station, and that to reach this spot, an almost impenetrable forest had to be passed through, requiring every step to be cleared by Lepchas with their long knives. On leaving Calcutta, I had hoped that the permanent propagating house, the gardener's house, and huts for the coolies, would have been finished in three months. Instead of which, it soon appeared that until a bridle path, eight miles long, could be finished, the buildings could not even be commenced, and that, instead of three months being required to complete them, two years was the shortest time in which they could be ready. No temporary buildings could be obtained either, except barracks on the windy and cold crest of Sinchal, 8,600 feet above the sea. Before these could be converted into a conservatory, glass had to be procured from Calcutta, 400 miles distant. The manufactory of flowerpots was also unknown at Darjeeling, and so that even they had to be obtained from Calcutta. Then no labour of any kind could be got to supply the place of the two Bengallee gardeners, who insisted on returning to Calcutta within three months of their arrival at Darjeeling; and the European gardener had therefore to perform all the operations of the simplest kind with his own hand, and this is still the case. Such an apparently easily procurable substance, as white river sand, could not be got in Sikhim, not that none existed there, but during the rains, the beds of the rivers were so full of water that the beds of sand were all concealed. Accordingly, a maund of sand was sent for from the Botanic Gardens in Calcutta. No packages of any kind ever reached Darjeeling from Calcutta in less than six weeks, the usual time occupied in the transit being two months. It will thus be seen that the commencement of chinchona cultivation in Darjeeling entailed a great many preliminary operations before the propagation of plants could be attempted; and it is only now that with tools, flowerpots, bell glasses, and hand frames received from Calcutta, and a determination to be contented with such means as are procurable in Darjeeling, that the success I have been able to report has been obtained.

I am glad to be able to report that on my visiting the chinchona nursery at Lebung in the end of May, I found all the plants in the highest health, and that the propagation of all the species, except *Chinchona Puhudiana*, was advancing rapidly. On my return to Calcutta, I prepared a report for submission to the Lieutenant Governor, and which I intended to forward separately from the Annual Report. I, however, now enclose it in the form of an Appendix to the Annual Report.

Expenditure.—Provision was made for the experiment of introducing chinchonas into British Sikhim to the amount of Rs. 14,753. 3. 2. from the commencement of the experiment in March 1862, until the end of April 1863. Considerable errors occurred in the approximate calculations of the sums required for the various charges of the year, some exceeded, while others fell below the calculated sums. The general result shows that the cultivation was

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carried on at a cost of Rs. 11,639. 2. 6. as appears by the annexed statement of the expenditure:—

STATEMENT of Expenditure incurred in the Period between 24th March 1862 and 30th April 1863, on account of the Introduction and Cultivation of Chinchonas in British Sikkim.

	Rs.	a.	p.
European gardener from March 1862 to 30th April 1863 -	1,998	6	2
Native gardeners - - - - -	266	7	-
Coolies and Sirdars - - - - -	677	11	10
House rent - - - - -	910	-	-
Travelling allowance for Europeans -	1,126	1	-
Ditto - ditto for Mallees - - - - -	12	9	3
Transit of Wardian cases, &c. - - - - -	1,302	7	9
Huts for Coolies, &c. - - - - -	25	-	-
Purchase and transport of flowerpots, tools, &c. -	2,330	3	11
Contingencies - - - - -	2,990	3	7
TOTAL - - - - - Rs.	11,639	2	6

The unexpected charge for procuring chinchona plants from Madras is included under the head of contingencies. As a European gardener and one Mallee were sent from Calcutta to Ootacamund for the plants, the sum incurred was considerable, amounting to Rs. 1,328. 15. 3.

APPENDIX.

From T. Anderson, Esq., M.D., Superintendent of the Botanic Gardens, Calcutta, and in charge of Chinchona Cultivation, to the Secretary to the Government of Bengal, 25th July 1863.

1. I HAVE the honour to report, for the information of the Lieutenant Governor of Bengal, that the condition of the chinchona plants at Darjeeling on the 15th June was most satisfactory.

2. In accordance with the orders of the Right Honourable the Secretary of State for India, no attention has been given since the 1st April to the increase of the stock of *Chinchona Pahudiana*. The increase of the other species has been great, and the plants are in excellent condition, so much so indeed, that a plant of *Chinchona succirubra* had grown nine inches in 30 days. The number of all species on the 15th June was 4,620 (the corresponding number on the 1st June 1862 was 211), and these plants were so covered with rigorous shoots, that I calculated that 6,000 plants could be added to the number of all the species, exclusive of *Pahudiana*, by 15th August, making a total number of 10,000 plants on that date. The most marked increase has been in the number of plants of *Chinchona officinalis*, of which I proposed only 93 plants received from Ceylon and Ootacamund on the 1st May; these have been increased to 573 on the 15th June. Seven hundred of the large plants of *Chinchona Pahudiana* have been planted in the open air at an elevation of 6,000 feet, and though they have been fully exposed to all weathers from bright sunshine to heavy rain, they are growing much more luxuriantly than when they were under shelter. I have for some time been unable to distinguish botanically between the species supplied from the Ootacamund nursery under the names *C. micrantha*, *C. nitida*, *C. Peruviana*. These seem to me in their present state to be one and the same species, probably *C. micrantha*. I have therefore adopted that name provisionally, in hopes that some of the plants, with increase of age, will take on the specific characters of *C. nitida* and *C. Peruviana*. Mr. Thwaites, the director of the Botanic Gardens, Ceylon, and who has given much attention to the experimental cultivation of cinchonæ in Ceylon, finds also that from seeds supplied to him as *C. micrantha*, *C. nitida*, and *C. Peruviana*, only one species was procured, or, at least, as yet he had been unable to distinguish more than one species.

3. In the commencement of June 1863, I supplied Dr. Simpson, civil surgeon of Darjeeling, with about 2 lbs. of fresh leaves of each of the following species:

—*C. succirubra*, *C. officinalis*, and *C. micrantha*. Decoctions, prepared with water slightly acidulated with sulphuric acid, were very bitter, and three patients suffering from well-marked intermittent fever were cured by the administration of these preparations alone. Towards the end of June, Dr. Simpson and I endeavoured to examine chemically the nature of the leaves of chinchona succirubra. We experimented on 1 lb. of fresh leaves. Our mode of procedure was as follows:—The fresh leaves were boiled in water, in which a certain quantity of carbonate of soda had been dissolved, and the dark coloured liquor resulting was thrown away. The mass of leaves after having all the alkaline water pressed out of them, was boiled in water with a small quantity of sulphuric acid. This was repeated three times, and the leaves were carefully squeezed at the end of each boiling. These acid liquors were then mixed and concentrated by boiling. The bitter acid, concentrated liquor, was then treated with carbonate of soda, and the neutral bitter liquid was afterwards set aside to cool, in the hopes that crystals might be obtained. Crystallization did take place on glasses under the microscope. The crystals are long and needle-shaped, and were so abundant as to appear to the naked eye as a whitish spot in the glass. A thin film of crystals (sulphate of quinine) also formed in the surface of the fluid, and could easily be skimmed off. These dissolved in water slightly acidulated with sulphuric acid, tasted very bitter. At this stage, however, the process was arrested, notwithstanding the removal of colouring matter by animal charcoal. The detection of crystals at all, with the means at our disposal, was unexpected. As it is, the undoubted presence of little needle-shaped crystals in a fluid obtained from the leaves of chinchona is worthy of record.

4. The cultivation of chinchona in British Sikhim is certain to be commenced soon by private individuals. Five hundred plants have been procured by private individuals from Mr. McIvor at Ootacamund, but they nearly all died on the route, one plant having reached Darjeeling alive. However, I have applications for more than 15 lacs of plants, and I shall soon be able to supply a few.

RETURN of Chinchona Plants in the Government Nursery at Darjeeling, on the 15th June 1863.

NAMES of SPECIES.	Number on the 1st April 1863.	Number of Plants on 15th June 1863.
<i>C. succirubra</i>	420	1,024
<i>C. Calisaya</i>	51	53
<i>C. officinalis</i>	125	573
<i>C. micrantha</i>	323	695
<i>C. Pabudiana</i>	1,892	2,275
TOTAL	2,811	4,620

— No. 2. —

From the Secretary of State for India to the Government of India,
7th September 1863.

1. THE specimens of dried leaves of *Chinchona succirubra*, transmitted in your letter dated 11th June (No. 34) 1863, together with a copy of a communication from the Superintendent of the Botanic Garden at Calcutta, have been forwarded to Mr. Howard, the manufacturer of quinine.

2. That gentleman reports that the leaves are not so well preserved as those sent by Mr. McIvor, and that the quantity is so small that he cannot undertake to obtain as good a result from the analysis of these specimens as he did from those received last June from the Neilgherry Hills.

3. With my despatch, dated 16th July (No. 51) 1863, I transmitted copies of Mr. Howard's report on the results of an analysis of specimens of bark, dried leaves, and decoctions and infusions of leaves from the Neilgherry Hills; by which

which you will perceive that chinchona leaves contain quinine, as well as a large per-centage of kinovic acid. This discovery, the possibility of which was first suggested by Dr. Anderson, is likely to lead to most beneficial results to the people of India; while the very satisfactory issue of Mr. Howard's analysis of the barks grown on the Neilgherry Hills, has finally established the success, as well as the great importance, of chinchona cultivation.

— Na. 3. —

REPORT ON Chinchona Cultivation at Darjeeling, from the 1st April 1863 to 15th July 1864, by T. Anderson, Esq., M.D., Superintendent of the Botanic Garden, Calcutta.

THIS report refers to the operations of a longer period than can be strictly included in the official year, but I have extended the period reported on to enable me to lay before the Lieutenant Governor, in the compass of one report, my proceedings up to this date in this important experiment.

The period to which this report refers may be considered as the second year of the experiment of cultivating chinchonas in the Himalaya, as the cultivation was commenced on the 1st June 1862. In the first annual report submitted on the 3rd August last year I referred to the numerous obstacles that had to be overcome before commencing the cultivation, as well as the difficulties that still continued to retard the more rapid increase of the stock of plants. Through more extended acquaintance with Darjeeling I have been able successfully to contend with many of these difficulties; but I am sorry to have to report that all my operations have been retarded, and much unnecessary labour incurred by the want of permanent buildings belonging to the cultivation, and situated on Government land near the site chosen for the open-air cultivation. The propagation of the plants is still carried on at Lepong in a private garden, which I have been obliged to rent for a second year, that is, until the end of April 1865. This garden, besides a dwelling-house occupied by the European gardener in charge of the cultivation, had not a single appliance of any kind for carrying on cultivation beyond a small conservatory manufactured out of old doors and windows, and so dilapidated that it had to be abandoned six months ago. In its place a temporary conservatory, consisting of a glass roof and wooden sides, was erected in January. The glass and wooden frames for this conservatory were sent from Calcutta, as it was impossible to procure them in Darjeeling.

On finding that the nurseries could not be removed to the permanent site till the end of another year, I made arrangements for adding a flue to the conservatory erected in January, and also for building a second conservatory with a flue. This second conservatory was completed about 15 days ago, and the flue of the other house is also finished. These flues, though not required at this season, will be an invaluable aid in carrying on the propagation during the coming winter. Owing to the want of artificial heat propagation was almost entirely stopped during the winter months. Twenty-five large frames with glass lights, and of the form usually known as cucumber frames, were provided during the last year to meet the large increase in the number of plants. The rooting of the cuttings has always been carried on in these frames with the assistance of slight bottom heat, obtained from the decay of heaps of vegetable matter. A large number of additional frames will be required almost immediately, as the rate of increase in the plants has now reached 6,000 a month.

Propagation.—The last published record of the number of plants is that dated 15th June 1863. The total number of plants on that date was 6,530. The number on the 15th July was 19,516. As *Chinchona Pahudiana* was not increased at all during this period, it must be excluded from the table while calculating the rate of increase during the past year, which is then 400 per cent. It is, however, deserving of notice as showing the great suitability of the climate of Darjeeling for the species *Chinchona officinalis* (var. *Bonplandiana*) that the rate of increase of that species has been nearly 2,000 per cent. during the same period. The rate of increase is now most satisfactory, and the cuttings obtained monthly are large and healthy. Cuttings root from 15 days to three weeks,

depending on the amount of sunshine. They root more quickly in sunshine than they can do in rainy weather. As I have already stated, the entire absence of artificial heat and of suitable conservatories prevented me attempting any propagation during the winter months, December, January, and February. A small increase was obtained in March, and since then the propagation has steadily increased every month. It is now about 6,000 a month.

In the first Table below I have given the results of the various reports of the numbers of plants on certain dates.

The second Table contains a statement of the number of plants with which the experiment was commenced in 1862; also of the number of plants received in April 1863 from Ootacamund and Ceylon. The sum of these columns compared with the numbers of June 1863 and 15th July 1864 will show the satisfactory progress that has been made.

TABLE showing the Increase of Chinchona Plants at Darjeeling from 15th June 1863 to 15th July 1864.

NAMES OF SPECIES.	15th June 1863.	23rd August 1863.	1st November 1863.	1st April 1864.	15th July 1864.	REMARKS.
<i>Chinchona succirubra</i> - - -	1,024	1,925	2,937	3,053	4,904	Not increased since 15th June 1863.
<i>Chinchona Calisaya</i> - - -	53	116	172	172	172	
<i>Chinchona officinalis</i> - - -	573	1,261	1,889	2,930	10,460	
<i>Chinchona micrantha</i> - - -	695	953	1,078	1,144	1,705	
<i>Chinchona Pahudiana</i> - - -	2,275	2,275	2,275	2,275	2,275	
TOTAL - - - -	4,620	6,530	8,351	9,574	19,516	

TABLE showing the Number of Chinchona Plants received at Darjeeling in 1862 and 1863, and the Annual Increase from them.

NAMES OF SPECIES.	Return of 1st June 1862.	Received from Ceylon and Ootacamund, 1st April 1863.	Return of 15th June 1863.	Return of 15th July 1864.	REMARKS.
<i>Chinchona succirubra</i> - - -	74	97	1,024	4,904	Eleven of these were received from Ceylon in January 1863.
<i>Chinchona Calisaya</i> - - -	5	21	53	172	
<i>Chinchona officinalis</i> - - -	none	105	573	10,460	
<i>Chinchona micrantha</i> - - -	79	115	695	1,705	
<i>Chinchona Pahudiana</i> - - -	53	none	2,275	2,275	
TOTAL - - - -	211	338	4,620	19,516	

Site of Permanent Nursery and Road to it.—In the first report of the introduction of Chinchona cultivation at Darjeeling I mentioned that the only Government land I could obtain was situated 10 miles from Darjeeling; that to reach it a road had to be made through a private estate, and running through a dense forest of oak, chestnut, laurels, cherries, and maples. This road was commenced in June 1862. It starts from the Ganges and Darjeeling cart-road at the point where that road crosses the saddle below Sinchal, about three miles from Darjeeling. The road is not completed yet to its proper width of eight feet; in several places it is not more than two and a half to three feet wide, but it was passable for ponies by the middle of October 1863. Estimates have been called for widening the road to 10 feet, and in the meantime the executive engineer has been requested to have it completed to the estimated width of eight feet with as little delay as possible. Its length from the point where it leaves the cart road is stated to be seven miles and three-quarters, thus making the distance to the end of the road about 11 miles from Darjeeling.

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The road terminates at a point about 6,000 feet above the sea in a forest consisting principally of *Michelia Cathcartii* and *lanuginosa*, *Bucklandia populifolia*, *Cyclodaphne*, *Alseodaphne*, *Prunus*, *Plectocomia*, and tree ferns, of which one specimen is 50 feet in height. The difficulty of erecting permanent nursery buildings at this distance from Darjeeling appears to me to be so great, especially after my experience of the difficulties of having any work rapidly finished even in the station of Darjeeling, that I endeavoured to procure a site for these buildings from Mr. Charles Barnes, whose large estates are contiguous to the Government land reserved for Chinchona plantations. That gentleman liberally asked me to choose any site I pleased to the extent of 10 acres, and I fixed on a suitable one in his estate near the tract where the open-air plantations will be formed. This site of 10 acres of level ground was made over to Government in perpetuity without any charge whatever, and under only one condition, that, should Government ever retire from the cultivation of Chinchona, and should wish to sell the buildings on the site given by Mr. Barnes, he or his heirs should have the option of buying the buildings at their cost price without any charge for the land in which they stand. I was permitted to accept the site on these terms. With the assistance of the executive engineer the sites for the European gardeners' dwelling-houses, the out-offices, and for the propagating-house were marked on the 13th November last. In the end of February I visited the site and found that all the places were being levelled for the buildings; that the preparation of the woodwork of one house was advancing slowly; and that a large number of bricks were being dried in the sun preparatory to burning them.

In the end of May little progress had been made in the buildings; the foundation walls of one house had been laid, about a lakh of bricks had been burnt, but the sites of other buildings had not even been levelled, and those for the out-houses had not been commenced. It seems probable now that all the buildings will be completed by the end of April 1865; by the time the second year's lease of the present nursery will expire.

Plantations.—In the middle of June 1864 I selected a suitable spot on the Government reserved land as the commencement of the open-air cultivation of Chinchona. This place is 3,743 feet above the sea as determined by the barometer, and is situated on the south-eastern slopes of a long spur from Sinchal. It is known to the Lepchas as Rungbee, and I have adopted this name for the plantation. The elevation of the lowest part of the spur is about 1,300 feet above the sea. The area of the land on it suitable for Chinchona cultivation is about 1,500 acres, from which a considerable deduction must be made for cliffs and rocky ground. Below 4,000 feet the land is partially cleared from the native cultivation of maize, millet, and eleusine. In the forest within the range adopted for Chinchona cultivation are found *Talauma Hodgsoni*, *Gordonia Wallichii*, three species of *Saurauja Actinidia*, several *Cucurbitaceæ*, several species of *Begonia*, *Sapindaceæ*, numerous *Labiata*, and at the lower altitudes, *Albizia* and *Bauhinia*, with *Clerodendron* and *Callicurpa*, several *Acanthaceæ*, a lofty *Artocarpus*, and several species of *Ficus*. A large pellate-leaved *Rottlera* is found everywhere on the spur up to 5,000 feet. *Endogeneæ* are abundant, though not numerous in species, and of them *Musa* forms the most marked feature of the vegetation of the spur up to 5,500 feet. The trees are clothed with *Pothos*. Orchids and epiphytic species of *Zingiberaceæ* (proving the extreme moisture and equability of the climate). Four species of bamboo occur at different altitudes, one of them scandent and resembling in habit like the *Chusquea* Kunth of the Andes.

Palms occur of the genera *Plectomia*, *Calamus*, *Areca*, *Cargota*. Ferns of the most tropical genera are abundant, and tree ferns are common from the base of the spur to 6,000 feet. The temperature of the air at the plantation formed at 3,743 feet has been frequently recorded since the end of June; the maximum temperature observed is 78°, and the minimum 64°.

After having fixed on the site for a plantation a road had to be made to it through the dense jungle; From the point in the forest where the road made by the Public Works Department ends, a path has been made five miles in length; the first part through tangled and prickly masses of *Plectomia*, and this was completed to the first plantation by the end of June, when the ground was also ready for the plants, having been cleared, trenched, and surface drained.

At the nursery at Lebong the Chinchonas intended for planting out were removed from their pots, packed in baskets with cocoanut fibre, and carried by coolies to the forest. Tents had been pitched there for the European gardeners, Mr. Mann and Mr. Jaffrey, who were engaged in planting out the Chinchonas during the three following days. The plants, varying from one foot to two and a-half feet in height, were placed five feet apart, each species by itself, and were left perfectly unprotected from the weather. A light fence was placed round the plantation to keep off cattle and wild animals.

The number of Chinchonas placed in the plantation:

Chinchona succirubra	-	-	-	-	-	-	100
„ officinalis	-	-	-	-	-	-	100
„ micrantha	-	-	-	-	-	-	50
„ Calisaya	-	-	-	-	-	-	2
„ Pahudiana	-	-	-	-	-	-	271
TOTAL							523

From this experimental plantation at 3,743 feet important results will, I hope, be obtained, as the comparative growth of plants of the different species alongside of each other and under the same condition will enable me to form an opinion of the altitudes best adapted to each. From this point the plantations to be formed next year (30 or 40 acres for all species exclusive of *Chinchona Pahudiana*) will radiate in all directions according to what are found to be the requirements of the plants. The plants were not in the most satisfactory state for experimenting on, as from their rapid growth and large size no further time could be lost either in planting them or making cuttings from them. They were therefore taken direct from the warm equable air of the green-house, and they will have greater difficulties to contend with than if they had been inured by degrees to the open air and all kinds of weather. All plants grown in the conservatories will, in future, go through the process called by gardeners "hardening off" before they are planted in the open ground. Sheds have been erected at the plantation at three different heights, at 3,743, 2,500, and 1,760 feet above the sea. In these I have placed a considerable number of all the species (in the lowest *C. succirubra* alone), which having yielded a great many crops of cuttings have become exhausted. By exposure to the open air they will after a while yield more vigorous cuttings than they have done lately, and afford at the same time some data concerning the comparative rate of growth of the species at different altitudes.

Seeds.—In April last I received 200 seeds of *Chinchona Calisaya* from Dr. Junghuhn. The seeds were produced in Java by one of the trees brought by Dr. Junghuhn from the Botanic Garden, Leyden, where it has been raised from seed sent from Bolivia by Dr. Weddell, the French botanist. Only nine of these seeds of this valuable species have germinated, but the young plants obtained are healthy, and have already three pairs of leaves. In the same month I received a quantity of seed of *Chinchona Pitayensis* from Mr. Markham. The seeds were sent to Mr. Markham from South America.

They were sown at Darjeeling in the first week of May in a slightly warm frame, but up to the 15th of July not one of them has germinated.

Establishment.—I am indebted to Sir W. Hooker for having nominated Mr. Gustav Mann for employment in the cultivation of Chinchona at Darjeeling. Mr. Mann had just returned from the West Coast of Africa, where he greatly distinguished himself in the capacity of Government botanist under the orders of the Admiralty. Mr. Mann arrived in India on the 14th March last, and he has been appointed head gardener in charge of the Chinchona cultivation at Darjeeling.

Mr. Jaffrey is attached to the cultivation as assistant gardener. Mr. Ryan as overseer has proved most useful in taking a general superintendence of the coolies; though not a trained gardener he has acquired several of the minor operations of gardening. It has been impossible to procure any class of natives except the lowest coolies. No sooner are these people taught to do the most ordinary work of the nursery, without constant European superintendence than they, either tired of the nature of the work or from some other cause, and almost usually

usually without any notice, abscond with wages due to them. The annoyance and unnecessary waste of time in teaching fresh gangs of coolies, only to be deserted by them in a month or two, have become so serious an evil that I shall immediately on my return to Calcutta endeavour to procure a party of dhangur coolies on an engagement to remain in Darjeeling at least for two years. To secure such men, a larger rate of wages must be given than I have estimated for.

Since last year the cultivation of Chinchona has been successfully commenced by two private individuals near Darjeeling, the plants having been obtained partly from Ootacamund and Ceylon. In one case the cultivation is carried on a scale which it is evidently intended to extend with the increase of the plants. A European gardener conducts the operation, and the plants in the nursery already exceed 1,000. The other experiment is on a smaller scale, and has been entirely conducted in the open air at an elevation of about 3,000 feet, and with only one species, *C. succirubra*, but also with success. I have had application from other proprietors of tea estates for assistance and advice in commencing similar experiments here, and in all cases I have rendered every assistance in my power.

T. Anderson, M.D.

— No. 4. —

From Sir Charles Wood to the Government of India.

24 February 1864.

1. YOUR letter, dated August 19th (No. 41) 1863, transmitting Dr. Anderson's Report on the cultivation of Chinchona plants in British Sikkim, has been under my consideration in Council, and I regret to find that the initiation of this important experiment in the neighbourhood of Darjeeling has been attended by so many difficulties and so much delay. Even now it appears that Dr. Anderson has only obtained the temporary occupation of a garden for one year, and that the preparation of a permanent site for a Chinchona plantation has not even been commenced. Your Excellency will doubtless take every suitable opportunity of fostering the plantations undertaken by your Government, and of encouraging the efforts of private enterprise to introduce the cultivation of these valuable plants into districts where it is likely to be attended with success.

2. With regard to Dr. Anderson's adoption of a single name for the three species of Chinchona plants yielding *grey bark*, I am of opinion that the change is likely to be attended with much inconvenience. The distinction between these three kinds is, as Dr. Anderson says, a matter of development, and no doubt the young plants are much alike; but it is equally certain that the specimens of bark and other parts of mature trees of the three kinds, as brought from Peru by Mr. Pritchett, differ very considerably. It is important that these distinctions should be indicated, especially when specimens of bark are sent to England for analysis; and as, owing to the immature state of the plants, there cannot be any scientific grounds, at present, for Dr. Anderson's change, it will be more convenient if in future he would indicate the number and condition of the three different kinds, *C. micrantha*, *C. Peruviana*, *C. nuda*, instead of placing them all under one name in his reports.

3. I shall watch with much interest the progress of Dr. Anderson's experimental cultivation at Darjeeling, which, considering the numerous difficulties to be overcome, appears on the whole to have made satisfactory progress; and I trust that such private undertakings as that of Dr. Lees in the Kangra Valley, and of Mr. Warren in Assam, will receive every legitimate encouragement from your Government.

— No. 5. —

From Sir *Charles Wood* to the Government of India.

29 February 1864.

1. I HAVE given directions for the transmission of 13 copies of Mr. Howard's work on Chinchona plants ("Nueva Quinologia de Pavon") for distribution in your Presidency. It will be valuable for purposes of reference to all persons who are interested in Chinchona cultivation; and copies might usefully be supplied to the public libraries in Calcutta, to the station libraries in hill districts, to the conservators of forests, and to the offices of commissioners and collectors in districts where Chinchona plants have been or are likely to be brought under cultivation. Copies might also be given to private individuals, such as Dr. W. Nassau Lees, who may be desirous of cultivating Chinchona plants.

2. Dr. Anderson, who is in charge of the Government Chinchona Nursery in Sikkim, is already furnished with a copy of this work.

— No. 6. —

REPORT on Chinchona Cultivation at Darjeeling during the Month of
January 1865.

From *T. Anderson*, Esq., M.D., Superintendent of the Botanic Gardens, to
S. C. Bayley, Esq., Junior Secretary to the Government of Bengal.

13 February 1865.

I HAVE the honour to submit the first of a series of monthly reports on the cultivation of Chinchona at Darjeeling. These monthly reports will contain, besides the account of the operations of the past month, a Tabular Statement of the growth of certain carefully measured plants of different species of Chinchona grown in the ground, in the open air, without shelter of any kind, in five plantations which have been formed at different elevations above the sea.

At the time of the submission of the last report on the cultivation of Chinchona, dated 15th July 1864, the cultivation was carried on in conservatories and in glazed frames at Lebong. The success attending the small open-air plantation at Rungbee, the formation of which was fully detailed in the last paragraphs of that report, induced me, in November and December, to remove all the Chinchona plants from Lebong to Rungbee. After the removal of the plants to Rungbee, the frames at Lebong, about 40 in number, were also taken to Rungbee and were filled with the smallest plants, while all the lately-rooted cuttings, but which were still in pots, were transferred to open-air beds, formed in parallel lines on a gentle slope. The plants were placed nine in a row, at six inches between each plant, each bed being about 200 feet long.

Three such beds were filled with young plants of *Chinchona officinalis* by the 15th of December. It was found better to remove all shade from the plants and to expose them fully night and day. The plants in these beds will be grown to yield cuttings. It is intended to keep 20,000 plants of each species for this purpose. After this number of stock-plants has been completed, all plants produced will be placed for a short time in beds situated near the ground, to be permanently planted. After remaining two or three months in these beds, or until they are 12 inches high, the plants will be placed in the permanent bark-yielding plantations at a fixed distance from each other, probably five feet apart.

The statement of the number of plants shows that, as 19,329 plants of *Chinchona officinalis* exist at Rungbee, the number of stock-plants of that species has been almost attained. The number will be completed in a week or two. These stock-plants will be allowed to grow for some time before cuttings are taken from them to form bark-yielding plants, as I am convinced that it is better to wait a short time for vigorous shoots than to swell up the monthly return by weak ill-formed cuttings, whose slowness of growth will never be compensated by their number. The number of the other species is still so far below what I require for stock purposes that all the cuttings obtained during the next five months at least will be added to the number of cutting-yielding plants. The reports

of

of the value of *Chinchona Pahudiana* are so conflicting that it does not appear advisable to abandon entirely the cultivation of this species. Sir William Hooker, in a letter of the 8th January 1865, writes to me that some well-known chemists seem to think more favourably of it now, and that Professor Miquel has informed him that *Chinchona Pahudiana* and *Chinchona Carabayensis*, Wedd., are the same.* This important identification was pointed out to me two years ago by Mr. Alan Black, the learned curator of the Royal Herbarium at Kew, on my forwarding to Kew flowering and fruiting branches of *Chinchona Pahudiana* from Java. This identification adds nothing to the commercial value of *Chinchona Pahudiana*. The tables in this report show the number and distribution of the plants of all species on the 1st February, and the growth during January of the measured plants. The short report by Mr. Mann on the condition of the plants is also given in full.

* Note.—These two species are quite distinct.—C. R. M.

NUMBER and Distribution of Chinchona Plants in the Government Plantation at Darjeeling on 1 February 1865.

NAME OF SPECIES OF CHINCHONA.	Number in permanent Plantation.	Number of Stock Plants for Propagation.	Number of Seedlings or Rooted Cuttings in Nursery Beds for permanent Plantations.	Number of Rooted Cuttings in Cutting Beds.	Number of Cuttings made during the Month.	Total Number of Plants, Cuttings, and Seedlings.
<i>C. succirubra</i> - - - -	339	2,731	- none -	- none -	1,660	4,780
<i>C. Calisaya</i> - - - -	none	23	- - -	- - -	none	23
<i>C. micrantha</i> - - - -	15	569	- - -	- - -	360	944
<i>C. officinalis</i> , including varieties -	50	11,479	- - -	- - -	7,800	19,329
<i>C. Pahudiana</i> - - - -	92	-	5,000	-	none	5,092
TOTAL - - - -	546	14,802	5,000	none	9,820	30,168

GENERAL REPORT on the Condition of the Plants with reference to the headings of the columns, and on the Operations of the past Month, by Mr. G. Mann, Assistant Conservator of Forests, British Sikhim.

The number of plants planted out permanently in October 1864, has been increased by the planting out of 260 *C. succirubra* at the lowest plantation.

The number of stock-plants has not been increased during the month, but remains the same as found by counting on the 1st December 1864, as growth has been very slow.

The seedlings of *C. Pahudiana* intended for permanent plantations remain still in the frames, and of the remaining species the plants in hand have not yet exceeded the number intended to be kept for stock-plants.

The number of cuttings made during the month amounts, as shown above, to 9,820, which were made on warm beds got up out of leaves, &c., cut on the spot, and are doing remarkably well.

The condition of the plants is in the highest degree satisfactory, considering the removal of almost all from Lebong to Rungbee, a distance of about 20 miles.

The work chiefly done during the month consists of having made the above-mentioned cuttings, planting in permanent plantation of 260 *C. succirubra*, and preparing of beds for the stock-plants for propagation and planting out of 2,100 plants of *C. officinalis*, in addition to 6,659 which were planted out in November last.

New roads have been cut out at four different places and are partly open, and have given us access to different portions of the reserve lands intended for plantations as the plants increase.

— No. 7. —

From T. Anderson, Esq., M.D., Superintendent, Botanical Gardens, to S. C. Bayley, Esq., Junior Secretary to the Government of Bengal.

Sir,

13 March 1865.

I HAVE the honour to submit the report on the cultivation of Chinchona at Darjeeling during the month of February 1865.

The month has been less favourable for growth than January, as the cold which has been quite as great as in January, has been accompanied by a very dry state of the atmosphere. Hail fell on the 3rd of the month and rain on five days, but with the exception of the 25th and 26th of the month only in slight showers, which did no benefit whatever to the Chinchona. The slight increase that appears in the table of growth took place almost entirely during the last five days of the month, with the exception of the lowest plantation, where about the 17th the plants began to show the first symptoms of the return of spring. At the first plantation (5,500 feet above the sea) the temperature has been very low, causing the destruction of at least three plants of *Chinchona Pahudiana*, and affecting a few of *Chinchona officinalis*. At the second plantation (4,350 feet above the sea) hoar frost occurred in several nights in February, but no damage has been done to any plants at this elevation. No frost was observed below this plantation. Observations on the temperature for the air have been made with more or less regularity during the month at the third, fourth, and fifth plantations. At the fourth plantation (2,500 feet above the sea) the maximum and minimum temperature in the shade was recorded every 24 hours during the month. The mean maximum temperature of the month at this elevation was 66.18, the mean minimum 47.93, and the monthly mean temperature 57.05. At the fifth, the lowest plantation, altitude 1,825 feet, fewer observations were made, as the plantation was not visited daily by the person observing; the results from the detached observations there give 71.56 as the mean maximum, and 47.77 as the mean minimum, and 59.5 as the mean temperature of the month.

The number of plants in the open ground for yielding bark has been increased by 220 plants of *Chinchona officinalis* taken from the number of plants intended to be kept for cuttings. The 9,820 cuttings made during last month have all rooted without a single exception, and have accordingly been transferred to the column of rooted cuttings. They will be planted during March in the beds for stock plants, and for permanent plantations.

No cuttings were made during the month, as no room could be provided until the cuttings made in January are disposed of, and besides the plants from which the cuttings are to be made, have only recently been planted in the open-air beds; after so sudden a change it is not advisable to run the risk of injury by removing leaves and branches as must be done in preparing cuttings.

The work done during the month consists of making roads, clearing and preparing jungle land for the permanent plantations, making terraced beds for nurseries, erecting sheds for coolies employed on the plantation, and temporary houses for the Europeans engaged in the cultivation. All the stores left at Lebong pending the erection of godowns at Rungbee have been removed during the month, and the temporary nursery at Lebong, where the cultivation has been carried on since 1st April 1863, has been entirely abandoned.

NUMBER and Distribution of Chinchona Plants in the Government Plantation at Darjeeling on 1 March 1865.

NAME OF SPECIES OF CHINCHONA.	Number in permanent Plantation.	Number of Stock Plants for Propagation.	Number of Seedlings or Rooted Cuttings in Nursery Beds for permanent Plantation.	Number of Rooted Cuttings in Cutting Beds.	Number of Cuttings made during the Month.	Total Number of Plants, Cuttings, and Seedlings.
<i>C. succiubra</i> - - - -	389	2,731	- none -	1,660	- none -	4,780
<i>C. Calisaya</i> - - - -	- none -	23	- - -	- none -	- - -	23
<i>C. micrantha</i> - - - -	15	569	- * -	360	- - -	944
<i>C. officinalis</i> , including varieties -	270	11,259	- - -	7,800	- - -	10,329
<i>C. Pahudiana</i> - - - -	92	- none -	5,000	- none -	- - -	5,092
TOTAL - - - -	766	14,582	5,000	9,820	- none -	30,168

ABSTRACT of Mr. G. Mann's Report.

At the middle plantation, 220 plants of *Chinchona officinalis* have been planted out permanently during the month, and continue to grow as much as could be expected this season, which has been so unusually dry that in many of the tea estates, a large proportion of the young tea plants have been destroyed, and which has rendered the operation of transferring plants from frames in the open ground more laborious than usual, as constant watering was required.

No cuttings have been made during the month, as it was considered advisable to remove the plants from the frames into the open beds for stock plants undisturbed.

The cuttings made during the month of January are all rooted without exception, and without any loss, but remain still in the frames to be gradually hardened for the transfer into open beds.

A frame has been planted with twenty-two *Chinchona officinalis*, and the same number of plants of exactly the same size have been planted out at the same time in an open bed to obtain results regarding the difference in the condition and number of cuttings obtained by the different methods of cultivation to be able to judge if it would be advisable to keep all the stock for propagation under glass.

During the month, three plants of *Chinchona Pahudiana* were killed by frost at the highest plantation, which however must partly be ascribed to their small size, as larger and sturdier plants on the same spot suffered, but were not killed.

The 2,100 plants of *Chinchona officinalis* planted out last November have been planted further apart, viz., from 6 inches to 18 inches, and in addition to the 8,759 plants which were in the open beds at the end of January, 2,500 more have been planted out on thirty-eight terraces, and are doing remarkably well, and would have done better if we had had rain in December, as is usual here in the hills.

The condition of the plants is excellent, and the greater suitability of Rungbee than of these places, where the cultivation had to be carried on formerly until we gained access to Rungbee, vouchsafes much more rapid progress in the experiment this year than it was possible to make before.

(signed) G. Mann.

— No. 8. —

From T. Anderson, Esq., M.D., Superintendent, Botanical Gardens, and in charge of Chinchonæ Cultivation in Bengal, to S. C. Bayley, Esq., Junior Secretary to the Government of Bengal.

Sir,

10 April 1865.

I HAVE the honour to transmit herewith the Report of the Chinchonæ Cultivation at Darjeeling for the month of March 1865.

REPORT on the Cultivation of Chinchonæ at Darjeeling during the Month of March 1865.

Now that the Chinchona plants are nearly all in the open air, the progress of the cultivation is much more dependent on the nature of the weather than when the plants were grown in conservatories, where the external cold could be counteracted by flues containing heated air, and where the moisture in the atmosphere could be increased or diminished according to the requirements of the plants.

In the open air the plants are in a much more natural condition than in conservatories; but this alteration in the cultivation requires me to record generally the meteorological conditions of the month, in order to show how the growth made during the month, and the operations of making cuttings, planting out, &c., and other works performed, have been affected by the weather.

The drawing up of rules for the guidance of those growing Chinchona, and the deciding of the very important questions of which is the best season for making cuttings, of forming permanent plantations for bark, and, above all, the time when bark can be most easily removed from the trees and dried. The time selected for the latter operation must be that of least growth, and this period will be most favourable, should it coincide with the driest and sunniest season of the year.

Meteorological records are kept in the open-air plantation, but for want of time these have been fully kept only at one plantation.

During March the weather has been extremely dry, the sky has been clear and cloudless, and though the sun has been very powerful, raising the thermometer to a mean maximum of nearly 80° at the lowest plantation; but, from the great radiation occurring during the still cloudless nights, the mean minimum temperature has been very low. The natural dryness has also been much increased by the extensive fires that have been raging all round; these have been caused by villagers burning the jungle for cultivation during the approaching rainy season.

At the fourth plantation the mean maximum during the month was 74·68°; the mean minimum 53·55°; mean temperature 64·11°.

At the fifth and lowest plantation the mean maximum temperature has been 78·89°, the mean minimum 53·8°, and the monthly mean temperature 66·34°.

These are not conditions favouring the growth of any plants, and certainly not of *Chinchona*, which require abundant moisture in the air, and an equable temperature.

Though the growth has been small, still there is a marked increase on that of February, and the plants are in perfect health, and have not suffered in the least degree from the dryness of the air.

Four hundred and twenty plants of *Chinchona officinalis* have been planted out in the bark-yielding plantation No. 3, 3,715 feet above the sea. Only 7,214 cuttings have been made during the month.

The nursery for the distribution of *Chinchona* was commenced during the month. Due notice will be given before any sale of *Chinchona* takes place. I expect to be able to distribute at least 1,000 plants on the 1st July. The plan I propose to adopt will be submitted for the approval of the Lieutenant Governor as soon as I can form an estimate of the number of plants I can dispose of during the year.

NUMBER and Distribution of *Chinchona* Plants in Government Plantation at Darjeeling, 1 April 1865.

NAME OF SPECIES OF CHINCHONA.	Number in permanent Plantation.	Number of Stock Plants for Propagation.	Number of Seedlings or Rooted Cuttings in Nursery Beds for permanent Plantations.	Number of Rooted Cuttings in Cutting Beds.	Number of Cuttings made during the Month.	Total Number of Plants, Cuttings, and Seedlings.
<i>C. succirubra</i>	389	2,731	none	1,660	2,250	7,030
<i>C. Calisaya</i>	none	23	-	none	14	37
<i>C. micrantha</i>	15	569	-	360	350	1,294
<i>C. officinalis</i> , including varieties	690	10,839	-	7,800	4,600	23,929
<i>C. Pahudiana</i>	92	none	5,000	none	none	5,092
TOTAL	1,186	14,162	5,000	9,820	7,214	37,382

During the month 420 *C. officinalis* have been planted out permanently at plantation No. 3, and are doing well.

The condition of the stock plants of *C. officinalis* in the open air has changed but little, as the atmosphere is extremely dry in consequence of the rapid increase of temperature, and the reckless destruction of all the vegetation around us by the natives, who are clearing the land at present for their crops; and for the last fortnight all the slopes have been in a continued blaze all around the spur on which the *Chinchona* cultivation is carried on just now.

During the month, 7,214 cuttings have been made. An unusually small number of these are *C. officinalis*, as the plants were partially checked by their removal from the frames into the open air, and because it was considered necessary that these stock plants should be allowed to make young and strong wood again before cutting them down for propagation.

The permanent planting out of the *C. Pahudiana* has been deferred on account of the parching dry weather we have had until now. The condition of the plants must be considered excellent, as, although growth has been slow, they have improved in appearance, and their roots have got well distributed in the ground, so that a luxuriant growth will no doubt commence as soon as the atmosphere becomes moister than it is at present.

The plants at Lebong last year were not so forward on the 1st of May as they are now at Rungbee.

The operations of the last month consisted in making the above-mentioned cuttings, planting out of *C. officinalis*, preparing beds for the stock plants of *C. succirubra*, and cleaning of a site for *C. Pahudiana*, and the construction of artificial watercourses for the watering of the beds containing the stock plants, which has enabled us to prevent the plants suffering, although we could not accelerate their growth, as the evaporation was most rapid and the country around us is so excessively dry, and this rapid evaporation naturally causes a reduction in the temperature of the air immediately around the plants.

— No. 9. —

From *T. A. Anderson*, Esq., M.D., Superintendent of the Botanical Gardens, to
S. C. Bayley, Esq., Junior Secretary to the Government of Bengal.

Sir,

Darjeeling, 22 May 1865.

I HAVE the honour to submit the following report on the cultivation of *Chinchona* at Darjeeling during the month of April 1865.

REPORT on the Cultivation of *Chinchona* at Darjeeling during the Month of April 1865.

THE weather during the first fortnight of April differed little from the weather that prevailed during March, but foggy and cloudy days were commoner.

With the exception of a slight thunder storm on the 13th, no rain fell until the 14th. After that date rain fell on 14 days to the amount of 11·18 inches, or the total rainfall for the month. The latter part of the month of April was therefore very moist and warm, and highly favourable to growth.

At the fourth plantation, the mean maximum temperature during the month was 74·5, the mean minimum 60°, and the monthly mean temperature 68·5.

At the fifth and lowest plantation, the mean maximum temperature was 85·4, the mean minimum 62·3, and the monthly mean 73·6. These figures indicate a great increase in the minimum temperature as compared with last month, while the mean maximum temperature at the fourth plantation has fallen slightly below that of March. These changes in the relation of the two extreme temperatures have resulted in a great increase of the mean temperature of the month.

2. The growth of the plants has everywhere been most satisfactory, and, especially at the lowest plantation, the condition of the plants of all species could hardly be surpassed.

The plants are covered with luxuriant foliage, and the largest are sending out vigorous branches from the axils of the three or four upper pairs of leaves.

3. The total number of plants and partially-rooted cuttings of all species was 49,486 on the 30th April. The number permanently planted out was 3,256. The number of plants added during the month to the number to be retained as stock plants was 9,820; all of these belonging to *Chinchona officinalis* were planted in beds in the open air.

The increase by cuttings during April far exceeds the number obtained; since the commencement of the experiment 12,104 cuttings of all species were made. None of these are buds; only vigorous shoots were used, as I consider it preferable to have healthy stock than a large monthly increase of cuttings taken from over-pruned plants. The 7,214 cuttings made during March have all rooted, and are ready to be potted off as soon as the establishment have completed the more urgent work of preparing ground for the rapidly increasing stock of plants.

4. In the Report for the month of February, I stated that an experiment had been made to ascertain the difference in the number of cuttings obtained from plants growing under glass and those growing in the soil and fully exposed. After two months, it has been found that the plants under glass yield a larger number of cuttings than plants entirely unprotected do. The proportion is three to five. No general reliable results can be obtained until the experiment has been carried on for a year; during the rains the plants in the open air will grow most luxuriantly, and will give a much larger proportion of cuttings than they have done during the dry season.

5. The operations at Runghee during April, in addition to the making of cuttings and the planting in the open air beds of 9,820 plants, consist of planting *Chinchona Pahudiana* in permanent plantations, making drains in nurseries and plantations and repairing the roads, all of which were much damaged during the heavy and sudden falls of rain occurring during the latter part of the month.

6. A new road, giving access to the southern slope of the spur has also been finished during the month. The nursery for the distribution of *Chinchona* plants has been commenced during the month by 1,000 cuttings of *Chinchona officinalis* having been placed in it.

Tables showing the number, distribution, and growth of *Chinchona* plants in the Government plantation at Darjeeling on the 1st May 1865:—

NUMBER and Distribution of Chinchona Plants in the Government Plantation at Darjeeling, 1st May 1865.

NAME OF SPECIES OF CHINCHONA.	Number in permanent Plantation.	Number of Stock Plants for Propagation.	Number of Seedlings or Rooted Cuttings in Nursery Beds for permanent Plantation.	Number of Rooted Cuttings in Cutting Beds	Number of Cuttings made during the Month.	Total Number of Plants, Cuttings, and Seedlings.
<i>C. succirubra</i> - - - -	389	4,331	- none -	2,250	3,820	10,850
<i>C. Calisaya</i> - - - -	none	23	- - - -	14	24	61
<i>C. micrantha</i> - - - -	15	929	- - - -	350	280	1,554
<i>C. officinalis</i> , including varieties -	690	18,689	- - - -	4,609	6,000	31,929
<i>C. Fahudiana</i> - - - -	2,162	- none -	2,930	- none -	- none -	5,092
TOTAL - - - -	3,256	23,982	2,930	7,214	12,104	49,486

— No. 10. —

From Sir Charles Wood to the Government of India.

Sir,

16 May 1865.

I HAVE received and considered in Council your letter, dated 31st January 1865, and am very glad to perceive that the accounts of the growth of the Chinchona trees at Darjeeling are so satisfactory.

— No. 11. —

From T. Anderson, Esq., M. D., Superintendent of the Botanical Gardens, to S. C. Bayley, Esq., Junior Secretary to the Government of Bengal.

Sir,

Darjeeling, 12 July 1865.

I HAVE the honour to submit the annexed Report on the cultivation of Chinchona at Darjeeling during the month of May 1865.

REPORT on the Cultivation of Chinchona at Darjeeling during the month of May 1865.

THE month was marked by great increase in the moisture of the atmosphere and by frequent showers, with bright sunny intervals followed by warm cloudy nights. Rain fell very generally throughout the month, there having been only eight days on which rain did not fall. The total rainfall at the fourth plantation was 14.5 inches.

At the fourth plantation the mean maximum temperature during the month was 80, the mean minimum 62.4, and the monthly mean temperature 71.7.

At the fifth plantation the mean maximum temperature was 83.8, the mean minimum 63.2, and the monthly mean temperature 70.6.

The changes that have occurred in these figures compared with the same records for April, show the near approach of the rainy season, while they indicate atmospheric conditions much more favourable to vegetation than the weather that prevailed in April. The equalising influence of the increased moisture is shown by the increase of the temperature at the fourth plantation, while it has reduced the great heat of the air at the fifth plantation, as shown by the maximum and mean temperatures for April and May, while it has raised the mean minimum temperature of May by nine-tenths of a degree.

2. These changes in the temperature and moisture of the air and the increased rainfall during the month have favoured the growth of all the species of Chinchona.

The increased vigour of the plants was, however, noticed only from the third plantation downwards at the two upper plantations, have not yet experienced the full force of the warm rain with which Sikkim is deluged during the 1st of June until the end of the rainy season.

3. The monthly growth, as indicated by the record of carefully measured plants, is perhaps best shown in a Tabular Statement of the greatest and best growth of each species at the different heights:—

TABLE

TABLE showing the Maximum and Minimum Growth of Species of Chinchona during May, at five different altitudes.

NAME or SPECIES.	First Plantation, Maximum and Minimum Growth.	Second Plantation, Maximum and Minimum Growth.	Third Plantation, Maximum and Minimum Growth.	Fourth Plantation, Maximum and Minimum Growth.	Fifth Plantation, Maximum and Minimum Growth.
	Inches.	Inches.	Inches.	Inches.	Inches.
<i>C. succirubra</i> - - -	- - -	- - -	- - -	1½ to 4½	1½ to 6
<i>C. micrantha</i> - - -	- - -	- - -	- - -	1½ to 5½	4 to 10½
<i>C. officinalis</i> - - -	½ to 1	½ to 1½	1½ to 2½	1½ to 8	1 to 6
<i>C. Pahudiana</i> - - -	½ to ½	9 0	9½ to 4½	1½ to 7½	1½ to 7½

The greatest growth during the month among the measured plants occurred in a fine plant of *Chinchona micrantha* at the lowest plantation, where this species is in the most perfect health. The most vigorous growth in *Chinchona succirubra* is also at this plantation. *Chinchona officinalis*, however, grows faster and is healthier in the cooler air of the fourth plantation.

4. The stock plants continue to grow well, and although they do not give the same amount of cuttings that could be obtained if the plants were grown under the protection of glass, still the cuttings are vigorous and healthy.

The number of cuttings made during the month was 6,071.

5. The cuttings made during April, 12,104, have all made roots, but for want of room they have been kept in the cutting beds. The total number of plants and partially rooted cuttings was, on the 31st May, 55,557.

NUMBER and Distribution of Chinchona Plants in the Government Plantation at Darjeeling, 1 June 1865.

NAME or SPECIES OF CHINCHONA.	Number in Permanent Plantation.	Number of Stock Plants for Propagation.	Number of Seedlings or Rooted Cuttings in Nursery Beds for Permanent Plantation.	Number of Rooted Cuttings in Cutting Beds.	Number of Cuttings made during the Month.	Total Number of Plants, Cuttings, and Seedlings.
<i>C. succirubra</i> - - -	389	4,391	- none -	6,070	8,500	14,800
<i>C. Calisaya</i> - - -	- none -	23	- - -	38	- none -	61
<i>C. micrantha</i> - - -	16	929	- - -	610	450	2,004
<i>C. officinalis</i> , including varieties -	890	18,639	- - -	12,600	2,121	34,050
<i>C. Pahudiana</i> - - -	2,162	- none -	2,930	- none -	- none -	5,092
TOTAL - - -	3,256	23,982	2,930	19,318	6,071	55,557

— No. 12. —

From T. Anderson, Esq., M.D., Superintendent of the Botanic Gardens, to S. C. Bayley, Esq., Junior Secretary to the Government of Bengal.

Sir,

20 September 1865.

I HAVE the honour to submit the annexed Report on the Cultivation of Chinchona at Darjeeling during the month of August 1865.

REPORT on the Cultivation of Chinchona at Darjeeling during August 1865.

THE growth of the plants continues to be satisfactory, and the increase by cuttings has been successfully carried on during the month. The total number of plants, and partially rooted cuttings of all species on the 1st September, was 92,038. The number of cuttings made during the month was 11,121.

2. The weather during the month of August has differed very little from that of June and July; there has been excessive rain, complete saturation of the atmosphere, accom-

panied by dense mist, and almost no sunshine, while an equable temperature has prevailed everywhere. Only on five days did no rain fall; the total fall of rain during the month at the fourth plantation was 41 inches, or 136.58 inches from the 1st of January.

The temperature at all the plantations has varied little from the temperature of the two previous months.

At the fourth plantation the mean maximum temperature was 85.54, the mean minimum 66.7, and the mean temperature 76.16.

At the fifth plantation nine observations of the minimum thermometer give a mean minimum temperature of 71.9.

3. During the month, the number of plants of *C. officinalis* at the first and second plantations has been increased to 100 plants at each plantation, making the total number of specimens permanently planted out 3,436.

4. The least and greatest growth of each species at the different plantations is given in this Table.

TABLE showing the Maximum and Minimum Growth of Species of Chinchona during August, at five different Plantations.

NAME OF SPECIES.	First Plantation, Maximum and Minimum Growth.	Second Plantation, Maximum and Minimum Growth.	Third Plantation, Maximum and Minimum Growth.	Fourth Plantation, Maximum and Minimum Growth.	Fifth Plantation, Maximum and Minimum Growth.
	<i>Inches.</i>	<i>Inches.</i>	<i>Inches.</i>	<i>Inches.</i>	<i>Inches.</i>
<i>C. succirubra</i>	- - -	- - -	2 to 3½	½ to 5½	½ to 9½
<i>C. micrantha</i>	- - -	- - -	¼ to 1½	4 to 12½	-
<i>C. officinalis</i>	½ to 4	½ to 2½	¼ to 4½	¼ to 6½	¼ to 3½
<i>C. Pahudiana</i>	¼ to 2½	1 to 3½	¼ to 4	3 to 9	3½ to 11

5. I have lately been able to correct an error which occurred in determining the height above the sea of the fifth plantations. The altitude of these plantations was found by observations made by a boiling-point thermometer, whose readings had been compared with a standard at the Calcutta Observatory. A large bubble of air had evidently become entangled among the mercury in the bulb during the journey from Calcutta, thus completely deranging the instrument. The error in the thermometer was detected after determining the height of a place in the Teesta Valley, whose altitude had previously been found by a mercurial barometer, but it was then too late to repeat the observations at the Chinchona plantations with trustworthy instruments. During the present rainy season, I found time to make a series of observations at all the plantations with two mountain barometers by Newman, and also with a boiling-point thermometer. These instruments had all been compared with standards at Calcutta, and I tested them at Darjeeling, at a point whose height had been determined by Dr. Hooker.

The corrections I have made are as follows:

1st Plantation, supposed height 5,500 feet, true height 5,321
2d - ditto - - - ditto - 4,350 - - - ditto - 5,000
3d - ditto - - - ditto - 3,715 - - - ditto - 4,410
4th - ditto - - - ditto - 2,500 - - - ditto - 3,332
5th - ditto - - - ditto - 1,825 - - - ditto - 2,550

NUMBER and Distribution of Chinchona Plants at the Government Plantations at Darjeeling, on the 1st September 1865.

NAME OF SPECIES OF CHINCHONA.	Number In Permanent Plantation.	Number of Stock Plants for Propagation.	Number of Seedlings or Rooted Cuttings in Nursery Beds for Permanent Plantation.	Number of Rooted Cuttings in Cutting Beds.	Number of Cuttings made during the Month.	Total Number of Plants, Cuttings, and Seedlings.
<i>C. succirubra</i>	389	10,000	none	18,095	5,530	34,014
<i>C. Calisaya</i>	none	23	-	74	11	108
<i>C. micrantha</i>	15	2,539	-	620	600	3,774
<i>C. officinalis</i> , including varieties	870	10,000	8,459	24,741	4,980	49,050
<i>C. Pahudiana</i>	2,162	none	2,930	none	none	5,092
TOTAL	3,436	22,562	11,389	43,530	11,121	92,038

— No. 13. —

From *T. Anderson, Esq., M.D.*, Superintendent of the Botanical Gardens, to *S. C. Bayley, Esq.*, Officiating Secretary to the Government of Bengal.

17 November 1865.

I HAVE the honour to submit the annexed Report on the Chinchona cultivation at Darjeeling during the month of September 1865.

REPORT of the Cultivation of Chinchonæ at Darjeeling during the month of September 1865.

I HAVE again to report the satisfactory advance of the propagation of all the species and the vigorous growth of the open air plants, especially of *C. succirubra* and *officinalis*. *C. micrantha* has as yet been tried in the open air only at the three lower plantations, and although the plants have grown luxuriantly, still they do not appear to be so healthy as those of the other species. No trustworthy experiments can be made with this species in the open air until a large stock of it has been obtained.

2. During September, 7,309 cuttings were made, thus raising the number of plants and partially-rooted cuttings on the 1st October to 99,347.

3. The weather during September was decidedly drier than usual; rain fell on only 13 days, while the remaining 17 days were bright and sunny. The amount of rain registered at the fourth plantation was 16 inches, making a total fall of 151.58 inches from the 1st January.

At the fourth plantation, the mean maximum temperature of the month was 84.65, the mean minimum 65.4, and the mean temperature 74.91. At the fifth plantation 10 observations of the minimum thermometer gave a mean minimum temperature of 69.4.

4. The greater amount of sunshine at the three upper plantations, where for the last three months the plants have been enveloped in dense mist, has caused an increase in the growth of all the species.

5. In an earlier report, I stated that the stock plants for propagation were planted in open air beds, where the plants, without any protection, were completely exposed to the air. The rate of growth of these plants, continually deprived, as they must be, of all the young shoots for cuttings, was found to be so slow, that the propagation, as soon as the rain ceased, would be nearly arrested. The cuttings from these open-air plants were also so slow in rooting, that even during the rainy season only one-fourth of the number of plants could be obtained, compared with the increase that the stock plants grown under glass would yield. I find that the only certain method of procuring a large annual increase is to keep all the stock plants (*i. e.*, plants from which the monthly crops of cuttings are obtained) in the confined air of low glazed frames, the plants being grown in prepared soil over which the frames are placed. When these stock plants have become thoroughly well established, each plant, during the rainy season, will yield two crops of cuttings in the month, with an average amount of two cuttings from each plant for each crop. From the 1st November until 1st April, only one cutting per plant can be expected during the month, or a fourth of the number produced during the rains. From this experience, gained during the rains, I determined in August, to place 10,000 plants of each species under glass in the manner indicated above, and to cultivate these plants for cuttings only.

6. During September, 10,000 plants of *C. succirubra* were planted in frames, while frames and beds were prepared for an equal number of *C. officinalis*, and for all the plants I possessed of *C. micrantha* and *Calisaya*. The benefit of this change in the method of treating the stock plants will hardly appear before November, as it will take six weeks before the plants recover from the shock they have received by being transplanted.

TABLE showing the Maximum and Minimum Growth of Species of Chinchonæ during September, at five different altitudes.

NAME OF SPECIES.	First Plantation, Maximum and Minimum Growth.	Second Plantation, Maximum and Minimum Growth.	Third Plantation, Maximum and Minimum Growth.	Fourth Plantation, Maximum and Minimum Growth.	Fifth Plantation, Maximum and Minimum Growth.
	Inches.	Inches.	Inches.	Inches.	Inches.
<i>C. succirubra</i>	- - -	- - -	1	½ to 11½	3 to 18½
<i>C. micrantha</i>	- - -	- - -	6½	11½	none.
<i>C. officinalis</i>	½ to 4½	1	½ to 3	3½ to 19	½ to 3½
<i>C. Pahudiana</i>	½ to 6½	½ to 6½	2 to 9	1½ to 6	½ to 5

NUMBER and Distribution of Chinchona Plants in the Government Plantation at Darjeeling, on the 1st October 1865.

NAME of SPECIES of CHINCHONÆ.	Number in Permanent Plantation.	Number of Stock Plants for Propagation.	Number of Seedlings or Rooted Cuttings in Nursery beds for Permanent Plantations.	Number of Rooted Cuttings in Cutting Beds.	Number of Cuttings made during the Month.	Total Number of Plants, Cuttings, and Seedlings.
<i>C. succirubra</i> - - -	389	10,000	- none -	23,625	5,020	39,034
<i>C. Calisaya</i> - - -	none	28	- - -	85	9	117
<i>C. officinalis</i> , including varieties	870	10,000	8,459	29,721	2,080	51,130
<i>C. micrantha</i> - - -	15	2,539	- - -	1,220	200	2,974
<i>C. Pahudiana</i> - - -	2,162	none	2,930	none	none	5,092
TOTAL - - -	3,436	22,562	11,389	54,651	7,309	99,347

— No. 14. —

From Sir *Charles Wood*, to the Governor General of India in Council.

India Office,

London, 30 September 1865.

Sir,

Para 1. I HEREWITH transmit, for your Excellency's information, ten copies of the Report of Mr. Howard's analysis of specimens of chinchona bark forwarded from the Neilgherry hills last May. You will observe that, although this analysis shows that the Neilgherry barks are very rich in febrifuge alkaloids, yet that "the crystallizations of quinine are mixed with some sulphate of chinchonidine, which is commercially, but not medicinally, a disadvantage." At present quinine is the only product of the bark which has great commercial value; yet it is the opinion of the most eminent chemists, such as Mr. Howard and Dr. de Vry, who have made the analysis of bark their special study, that of the other chinchona alkaloids, chinchonidine and quinidine are very nearly as efficacious as quinine, and that chinchonine, though inferior to the other three, is by no means deficient in febrifuge qualities.

2. I consider it very important, as affecting the commercial interests of the chinchona experiment, that an authoritative medical decision should be pronounced on the relative value of the chinchona alkaloids, other than quinine, namely, chinchonidine, quinidine, and chinchonine. The best way of attaining this object would be to appoint a commission in each Presidency, with instructions to test the efficiency of these alkaloids on a scale sufficiently extensive to ensure decisive results. Such a commission should be composed of medical men, who have had long experience in the treatment of fevers, and whose report on a question of this nature would have weight with the medical profession generally. I desire that a commission for this purpose may be nominated, and in the meanwhile I shall give directions for a supply of the alkaloids in question to be carefully prepared at Mr. Howard's manufactory, and sent out in sufficient quantity to ensure a satisfactory trial of their efficacy. The conclusions arrived at by the commission should be embodied in a report.

I have, &c.
(signed) *C. Wood*.

— No. 15. —

From *T. Anderson*, Esq., M.D., Superintendent, Botanical Gardens, to *S. C. Bayley*, Esq., Junior Secretary to the Government of Bengal.

3 January 1866.

I HAVE the honour to transmit herewith the Report of the chinchona cultivation at Darjeeling for the month of October 1865.

REPORT

REPORT of the Cultivation of Chinchona at Darjeeling during the Month of October 1865.

I AM glad to be able to report the continued success of the cultivation. The number of cuttings made during the month was 9,615, making a total number of plants and cuttings in all stages of growth, 108,962. The alterations in the mode of growing the plants from which cuttings are obtained has been completed for all the species. The full number of stock plants for cutting (10,000), has been attained in the case of *C. succirubra* and *C. officinalis*; but some months must elapse before the number of stock plants of *C. micrantha* is completed.

As I possess only 142 plants and cuttings of *C. Calisaya*, this valuable species must be cultivated under the shelter of glass for some years longer. During the month 14,500 well rooted plants of *C. succirubra* were planted in open air beds, from which they will be transferred in April next to the open ground.

2. The first public sale of chinchona took place on the 2d October. Three purchasers attended, who among them bought the 1,000 plants offered for sale at the upset price of four annas each; only *C. officinalis* was sold.

3. The temperature of the past month has been considerably lower than that of September, the greatest difference being in the mean minimum temperature from the clear cloudless nights favouring radiation.

4. The rainfall has also greatly diminished; only one and half-inch of rain were recorded during the month, making a total fall of 153.08 inches from the 1st January. The mean maximum temperature at the fourth plantation was 80.06. The mean minimum 59.19, and the mean temperature of the month 69.62.

5. At the fifth and lowest plantation nine observations of the minimum thermometer give a minimum temperature of 61.3.

6. This decrease in the temperature, accompanied by dryness of the atmosphere, has affected the growth of the plants. The period of rest is rapidly approaching when the plants will remain almost dormant.

TABLE showing the Maximum and Minimum Growth during October 1865.

NAME of SPECIES.	First Plantation, Maximum and Minimum Growth.	Second Plantation, Maximum and Minimum Growth.	Third Plantation, Maximum and Minimum Growth.	Fourth Plantation, Maximum and Minimum Growth.	Fifth Plantation, Maximum and Minimum Growth.
<i>C. succirubra</i> - - -	- - -	- - -	½ to 1 inch	½ to 2½ inches	½ to 6½ inches.
<i>C. micrantha</i> - - -	- - -	- - -	½ inch	1 inch	none.
<i>C. officinalis</i> - - -	½ to 1½ inches	1 to 2 inches	½ to 4 inches	½ to 2 inches	½ to 2½ inches.
<i>C. Pahudiana</i> - - -	½ to 1 inch	½ to 3 "	½ to 2 "	1 to 5½ "	1 to 3½ "

NUMBER and Distribution of Chinchona Plants in the Government Plantations at Darjeeling on the 1st November 1865.

NAME of SPECIES of CHINCHONÆ.	Number in Permanent Plantations.	Number of Stock Plants for Propagation.	Number of Seedlings or Rooted Cuttings in Nursery Beds for Permanent Plantations.	Number of Rooted Cuttings in Cutting Beds.	Number of Cuttings made during the Month.	Total Number of Plants, Cuttings, and Seedlings.
<i>C. succirubra</i> - - -	389	10,000	14,500	14,145	4,100	43,134
<i>C. Calisaya</i> - - -	-	23	-	94	25	142
<i>C. micrantha</i> - - -	15	2,539	-	1,420	390	4,264
<i>C. officinalis</i> , including varieties	870	10,000	8,459	31,801	5,200	56,330
<i>C. Pahudiana</i> - - -	5,092	-	-	-	-	5,092
TOTAL - - -	6,366	22,562	22,959	47,460	9,615	108,962

— No. 16. —

From *T. Anderson*, Esq., M.D., Superintendent, Botanic Gardens, to the Junior Secretary to the Government of Bengal.

2 March 1866.

I HAVE the honour to transmit herewith the Report of the chinchona cultivation at Darjeeling for the month of November 1865.

REPORT of the Cultivation of Chinchonæ at Darjeeling during the Month of November 1865.

I HAVE little to report this month beyond the usual steady increase in the number of plants, and the continued good condition of the plants. The increasing cold, accompanied by great dryness, has reduced the rate of growth below that of last month. At the upper plantation growth has nearly ceased, but at the two lower plantations some of the plants have grown more than three inches during the month. The approach of the cold season has also affected the operations of artificial propagation by cuttings, only 8,280 cuttings having been made, which is 1,335 cuttings less than the number procured in October. The total number of plants and cuttings of all species is 117,242.

2. The weather during the month was cold and dry, with bright sunny days, until the 21st; after that date, during the nights and mornings, the sky was clear, but thick fogs prevailed during the day above the second plantation.

3. On the 25th a thunder-storm, accompanied by hail and rain, passed over Darjeeling; at Rungbee a little hail, followed by a few drops of rain, fell. The quantity was too small to be appreciable in the rain gauge.

4. At the fourth plantation, the mean maximum temperature was 77.63. The mean minimum 52.2, and the mean temperature of the month was 64.91.

TABLE showing the Maximum and Minimum Growth during November 1865.

NAME of SPECIES.	First Plantation.	Second Plantation.	Third Plantation.	Fourth Plantation.	Fifth Plantation.
<i>C. succirubra</i>	- - -	- - -	$\frac{1}{2}$ inch - -	$\frac{1}{2}$ in. to 1 in. -	$\frac{1}{2}$ in. to 3 $\frac{1}{2}$ in.
<i>C. micrantha</i>	- - -	- - -	none - -	none - -	none.
<i>C. officinalis</i>	$\frac{1}{2}$ inch - -	1 in. to 1 $\frac{1}{2}$ in.	$\frac{1}{2}$ in. to 1 $\frac{1}{2}$ in. -	$\frac{1}{2}$ in. to 2 in. -	$\frac{1}{2}$ in. to 1 $\frac{1}{2}$ in.
<i>C. Pahudiana</i>	$\frac{1}{2}$ in. to $\frac{3}{4}$ in. -	$\frac{1}{2}$ in. to 1 $\frac{1}{2}$ in.	$\frac{1}{2}$ inch - -	$\frac{1}{2}$ in. to 2 $\frac{1}{2}$ in. -	2 in. to 3 in.

NUMBER and Distribution of Chinchona Plants in the Government Plantations at Rungbee, on the 1st December 1865.

NAME of SPECIES of CHINCHONÆ.	Number in Permanent Plantations.	Number of Stock Plants for Propagation.	Number of Seedlings or Rooted Cuttings in Nursery Beds for Permanent Plantations.	Number of Rooted Cuttings in Cutting Beds.	Number of Cuttings made during the Month.	Total Number of Plants, Cuttings, and Seedlings.
<i>C. succirubra</i>	389	10,000	14,500	18,245	2,900	46,084
<i>C. Calisaya</i>	none	26	- - -	116	none	142
<i>C. micrantha</i>	15	2,539	- - -	1,710	280	4,544
<i>C. officinalis</i> , including varieties	870	10,000	8,459	37,001	5,100	61,430
<i>C. Pahudiana</i>	5,092	none	- - -	none	none	5,092
TOTAL	6,366	22,565	22,959	57,072	8,280	117,242

— No. 17. —

From *Thomas Anderson, Esq., M.D.*, Superintendent, Botanical Gardens, and in charge of Chinchona Cultivation in Bengal, to the Junior Secretary to the Government of Bengal.

17 March 1866.

I HAVE the honour to forward the Report on the cultivation of Chinchona at Darjeeling, for the month of December 1865.

REPORT of the Cultivation of Chinchona at Darjeeling, during the Month of December 1865.

THE great cold of this month has affected all the operations of the cultivation, as well as the growth of the plants in the open air. Only 3,610 cuttings were made during the month. The plants grown under glass have yielded a considerable number of cuttings; the largest number has been obtained from *C. officinalis* and its varieties. In all the plantations, except the lowest, growth has ceased, and the plants are in a state of complete rest. At the lowest plantation the plants have continued to grow during December, as the air of this plantation is moist and warm from the situation between two deep gorges in which the streams Runjo and Rungbee flow.

2. During this month a small plantation of *C. succirubra* has been formed in the Teesta valley, in an open sâl forest, at an elevation of 1,000 feet above the sea. The temperature and amount of moisture in this sâl forest are very different from the conditions at Rungbee, and the growth of the plants in the new site will be watched with great interest. No care, of course, can be taken of them beyond surrounding the plantation with a fence, and keeping the plants tolerably free from weeds. The site of the plantation was first cleared from trees and undergrowth, so that the plants are fully exposed to sun-light. Some months must elapse before any opinion can be formed of the state of the plants in this plantation. If they succeed, the cultivation of *C. succirubra* may afterwards be extended to the dry sâl forest of the Terai.

3. The weather, during December, has been cold, cloudy, and misty at the upper plantations; and, from the fourth plantation downwards, the air has been dry, with a clear sky, warm sunshine, and great nocturnal radiation.

4. On the 26th, one-tenth of an inch of rain fell, making the total rain-fall, from the 1st January to 31st December 1865, at the fourth plantation, 3,332 feet above the sea, 153.18 inches.

5. At the fourth plantation the mean maximum temperature was 63.67. The mean minimum 46.87, and the mean temperature 55.27. These figures show a decrease in the temperature since last month. At the first plantation the highest temperature observed during the month was 61, and the lowest 35, on the morning of the 29th December.

TABLE showing the Maximum and Minimum Growth during December 1865.

NAME of SPECIES.	First Plantation.	Second Plantation.	Third Plantation.	Fourth Plantation.	Fifth Plantation.
<i>C. succirubra</i>	-	-	- none -	½ in. to ¾ in.	½ in. to 1 ½ in.
<i>C. micrantha</i>	-	-	- none -	- none -	- none -
<i>C. officinalis</i>	- none -	½ inch	½ in. to 3 in.	½ inch	½ in. to 2 ½ in.
<i>C. Pahudiana</i>	- none -	- none -	½ inch	½ inch	½ in. to 1 in.

NUMBER and Distribution of Chinchona Plants in the Government Plantations at Rungbee, on the 1st January 1866.

NAME of SPECIES of CHINCHONÆ.	Number in Permanent Plantations.	Number of Stock Plants for Propagation.	Number of Seedlings or Rooted Cuttings in Nursery Beds for Permanent Plantations.	Number of Rooted Cuttings in Cutting Beds.	Number of Cuttings made during the Month.	Total Number of Plants, Cuttings, and Seedlings.
<i>C. succirubra</i>	489	10,000	14,400	21,145	1,500	47,534
<i>C. Calisaya</i>	- none -	26	-	116	- none -	142
<i>C. micrantha</i>	15	2,539	-	1,990	210	4,754
<i>C. officinalis</i> , including varieties	870	10,000	6,459	48,101	1,900	68,330
<i>C. Pahudiana</i>	5,092	- none -	- none -	- none -	- none -	5,092
Total	6,466	22,565	22,859	65,352	3,610	120,852

—No. 18.—

From Messrs. *Mair & Co.* to the Secretary of State for India.

6, Lime-street, London. E. C.,

9 August 1864.

Sir,

HAVING in our care extensive tracts of land in Darjeeling, chiefly under tea cultivation for several companies, among which are the Lebong and Himalaya, with London Boards; and knowing your desire to promote the interests of India, we beg to inform you that we are sending out a trained Scotch gardener by the steamer of the 20th instant, who will find forcing-houses and the requirements necessary for the cultivation of chinchona ready for him. We are advised by the head of our firm, who is now at Darjeeling, that it is the intention of the Government to sell its chinchona plants some time hence, when, doubtless, we shall be extensive buyers; but, in the meantime, we should esteem it a favour if you would direct Dr. Anderson to give to Messrs. Mair & Co. a few plants, even if it were only two or three of each variety, that our gardener might commence the cultivation of them on his arrival there.

Hoping that we have not made an unreasonable request, and begging that you will excuse the liberty we take in writing to you, which we do with the knowledge that you alone can assist us in this important matter,

We are, &c.

(signed) for *David K. Mair & Co.*
J. H. Norman.

—No. 19.—

From Mr. *Merivale* to Messrs. *Mair & Co.*

Sir,

India Office, 18 August 1864.

I AM directed by Sir Charles Wood to acknowledge the receipt of your letter, dated the 9th instant, requesting that your gardener may be supplied with a few chinchona plants on his arrival at Darjeeling.

2. Sir Charles Wood is extremely desirous to see the cultivation of chinchona plants undertaken by private enterprise, and he has recently expressed his views on this point to the Government of India, to whom, or to the Government of Bengal, application should be made to ascertain whether any plants are available for sale at Darjeeling.

3. The plantations on the Neilgherry Hills are on a much larger scale, and 31,662 plants have already been distributed to private individuals. You can purchase plants from these plantations in sufficient numbers to commence their cultivation on a moderate scale, by applying to Mr. William G. McIvor, the Government Superintendent.

I am, &c.

(signed) *Herman Merivale.*

— No. 20. —

From *T. Anderson, Esq., M.D.*, Superintendent, Botanical Gardens, and in charge of Chinchona Cultivation in Bengal, to the Officiating Junior Secretary to the Government of Bengal.

6 April 1866.

I HAVE the honour to forward the Report on the cultivation of Chinchona at Darjeeling, for the month of January 1866.

REPORT of the Cultivation of Chinchona at Darjeeling, during the Month of January 1866.

JANUARY is always the coldest month at Darjeeling, and accordingly vegetation is completely arrested until the return of spring, about the middle of February. I have, therefore, little progress to report this month. No cuttings of *C. succirubra* were made; and only 1,100 of *C. officinalis* were obtained during January. The valuable species *C. Calisaya*, however, yielded 12 cuttings, making 1,112 cuttings of all species as the increase made during this month. The total number of plants planted out permanently in the open air has been increased to 6,598 by the formation of three small plantations in the Teesta valley. The young plants of *C. succirubra* in open unprotected beds for the formation in April of bark yielding plantations, have been increased this month to 16,783. The total number of plants and cuttings of all species of Chinchona on the 31st January was 138,008.

2. A quantity of seed of *C. officinalis* yielded by plants grown at the Chinchona plantations in Ceylon has been sent to me by Mr. Thwaites, the Director of the Ceylon Botanical Gardens. The seed has been sown at the distribution nursery at Rungyroong.

3. Eighty-eight plants of Chinchona were distributed during the month.

4. The repairing of the road through the plantations (about five miles in length) was completed during the month. A bridge across the Rungbee stream has been commenced in order to admit of the plantations now being opened up at Rishap being visited during the rains, when the Rungbee is impassable. The site of the permanent plantations at Rishap has been cleared of jungle, and the stumps have been rooted out over an extent of nearly three acres.

5. The weather during January has much resembled what prevailed during December, only that the temperature has been lower, and a small quantity of rain has fallen. 2.2 inches of rain were recorded at Rungbee during this month. At the second plantation, 5,000 feet above the sea, the mean maximum temperature was 54.6, the mean minimum 37.4, and the monthly mean temperature 46. At the fourth plantation, the mean maximum temperature was 59.4, the mean minimum 48.4, and the mean temperature 53.9. At the fifth plantation, 2,556 feet above the sea, 16 observations give the following results:—The mean maximum temperature was 65.5, the mean minimum 47.5, and the mean temperature 56.5. At the first plantation, the self-registering thermometer was observed on six distinct days. The highest temperature observed was 66 degrees, and the lowest 34 degrees.

TABLE showing the Maximum and Minimum Growth during January 1866.

NAME of SPECIES.	First Plantation.	Second Plantation.	Third Plantation.	Fourth Plantation.	Fifth Plantation.
<i>C. succirubra</i> - - -	- - -	- - -	- none -	$\frac{1}{2}$ in. to $\frac{1}{2}$ in. -	$\frac{1}{2}$ in. to 2 in.
<i>C. micrantha</i> - - -	- - -	- - -	- none -	- none -	- none.
<i>C. officinalis</i> - - -	- none -	- none -	$\frac{1}{2}$ in. to 1 $\frac{1}{2}$ in. -	- none -	$\frac{1}{2}$ in. to 1 $\frac{1}{2}$.
<i>C. Pahudiana</i> - - -	$\frac{1}{2}$ inch -	$\frac{1}{2}$ inch -	$\frac{1}{2}$ inch -	2 $\frac{1}{2}$ inches -	$\frac{1}{2}$ in. to 1 in.

NUMBER and Distribution of the Chinchona Plants in the Government Plantations at Rungbee, on the 1st February 1866.

NAME of SPECIES of CHINCHONÆ.	Number in Permanent Plantations.	Number of Stock Plants for Propagation.	Number of Seedlings or Rooted Cuttings in Nursery Beds for Permanent Plantations.	Number of Rooted Cuttings in Cutting Beds.	Number of Cuttings made during the Month.	Total Number of Plants, Cuttings, and Seedlings.
<i>C. succirubra</i> - - -	606	10,000	16,788	37,145	- none -	64,534
<i>C. Calisaya</i> - - -	- none -	26	- none -	119	12	157
<i>C. micrantha</i> - - -	30	2,539	- none -	2,185	- none -	4,754
<i>C. officinalis</i> , including varieties	870	10,000	7,500	44,001	1,100	63,471
<i>C. Pahudiana</i> - - -	5,092	- none -	- none -	- none -	- none -	5,092
TOTAL - - -	6,598	22,565	24,288	83,450	1,112	138,008

— No. 21. —

From *T. Anderson*, Esq., M.D., Superintendent, Botanical Gardens, and in charge of Chinchona Cultivation in Bengal, to the Officiating Junior Secretary to the Government of Bengal.

13 April 1866.

I HAVE the honour to forward the Report on the cultivation of Chinchonæ at Darjeeling, for the month of February 1866.

REPORT of the Cultivation of Chinchonæ at Darjeeling, during the Month of February 1866.

THE progress of the cultivation of Chinchonæ at Darjeeling continues to be satisfactory. Eight thousand and nine hundred (8,900) cuttings were made in February, and several thousands seeds of *C. officinalis* received from Ceylon germinated. These seedlings are too small yet to be included in the number of plants in the nurseries. The total number of plants and cuttings on the 1st March was 146,908. The distribution of these in the open air and nursery beds remains the same as last month.

2. During the month, 780 plants of Chinchonæ were distributed; the applicants receiving them were Dr. Jameson, Botanical Gardens, North-Western Provinces, Saharunpore; Scottish Assam Tea Company, and Dr. Fraser, Her Majesty's 88th Regiment, for a Chinchona plantation at Kangra.

3. The weather during February was unusually inclement, the cold having been greater than in January. About the middle of the month a snow-storm occurred over a great part of the Himalaya; at Darjeeling it was accompanied by severe frost. The fall of snow did not extend even to the upper plantations, but much hail followed by rain fell at the upper plantations, and on the 13th the thermometer at Plantation No. 1 stood at 30 degrees. The amount of rain during the month was 3.5 inches.

TABLE showing the Temperature of the Month at the different Plantations.

Plantations.	Mean Maximum.	Mean Minimum.	Mean.
1st Plantation - - -	51.5	35.3	43.4
2nd ditto - - -	56.3	36.7	46.5
3rd ditto - - -	62.3	41.7	52.
4th ditto - - -	61.6	49.2	55.4
5th ditto - - -	67.7	48.1	57.9

4. Growth

4. Growth commenced at the two lower plantations about the 20th of the month, but up to the end of the month no signs of the return of spring were noticed above 4,000 feet.

TABLE showing the Maximum and Minimum Growth during February 1866.

NAME of SPECIES.	First Plantation.	Second Plantation.	Third Plantation.	Fourth Plantation.	Fifth Plantation.
<i>C. succirubra</i> - - -	none	none	none	½ in. to 1 in.	½ in. to 3½ in.
<i>C. micrantha</i> - - -	none	none	none	none	none.
<i>C. officinalis</i> - - -	none	½ inch	½ in. to ¾ in.	½ in. to 1½ in.	½ in. to 1½ in.
<i>C. Pahudiana</i> - - -	none	½ inch	none	½ in. to 1½ in.	1½ in. to 2½ in.

NUMBER and Distribution of the Chinchona Plants in the Government Plantations at Rungbee, on the 1st March 1866.

NAME of SPECIES of CHINCHONÆ.	Number in Permanent Plantations.	Number of Stock Plants for Propagation.	Number of Seedlings or Rooted Cuttings in Nursery Beds for Permanent Plantations.	Number of Rooted Cuttings in Cutting Beds.	Number of Cuttings made during the Month.	Total Number of Plants, Cuttings, and Seedlings.
<i>C. succirubra</i> - - -	606	10,000	16,788	37,145	2,000	66,534
<i>C. Calimya</i> - - -	none	26	none	131	none	157
<i>C. micrantha</i> - - -	30	2,539	none	2,185	400	5,154
<i>C. officinalis</i> , including varieties	870	10,000	7,500	45,101	6,500	69,971
<i>C. Pahudiana</i> - - -	5,092	none	none	none	none	5,092
TOTAL - - -	6,598	22,565	24,288	84,562	8,900	146,908

— No. 22. —

From *T. Anderson*, Esq., M.D., Superintendent, Botanical Gardens, and in charge of Chinchona Cultivation in Bengal, to the Officiating Junior Secretary to the Government of Bengal.

1 May 1866.

I HAVE the honour to forward the Report on the cultivation of Chinchonæ at Darjeeling, for the month of March 1866.

REPORT of the Cultivation of Chinchonæ at Darjeeling, during the Month of March 1866.

I HAVE to report the continued success of the experiment. The return of warm weather has forwarded all the operations of the cultivation, besides increasing the amount of growth of the plants permanently planted out. The increase by cuttings and seedlings has raised the number of plants in all stages of growth to 178,741. These figures include the 10,781 plants in the distribution nursery at Rungyroong, which have hitherto not appeared in the monthly return. Sixteen thousand eight hundred and ninety-five (16,895) cuttings were made during the month; this is the largest number that has been obtained in one month since the commencement of the experiment at Darjeeling. Three thousand and one hundred (3,100) seedlings of *C. officinalis* having attained a considerable size, have been added during the month to the plants kept for permanent plantations. More seeds are germinating daily, and I have received another packet of seed of *C. officinalis* collected from the plants that have flowered in the Chinchona plantations in Ceylon. There are now 89,821 plants and cuttings of this valuable species in the Darjeeling nurseries.

2. Two hundred and ninety (290) plants were distributed during the month.

353.

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3. The weather during March was clear and windy, and very dry. No rain fell during the month, and very little dew occurred during the nights, in consequence of the continued strong winds. The days were generally hot and sunny, while the temperature at night often fell 25 degrees below that of the day. Such weather is not favourable to vegetation of any kind, and accordingly the growth of the Chinchonas during March was not nearly so great as it would have been, had any rain fallen during the month.

TABLE showing the Temperature of the Month at the different Plantations.

Plantations.	Mean- Maximum.	Mean Minimum.	Mean.
1st Plantation - - -	67.5	47.3	57.4
2nd ditto - - -	70.2	49.6	59.9
3rd ditto - - -	77.	55.8	66.4
4th ditto - - -	75.2	60.6	67.9
5th ditto - - -	82.9	59.3	71.1

TABLE showing the Maximum and Minimum Growth during March 1866.

NAME of SPECIES.	First Plantation.	Second Plantation.	Third Plantation.	Fourth Plantation.	Fifth Plantation.
<i>C. succirubra</i> - - -	none	none	none	$\frac{1}{2}$ to 1 inch	$\frac{1}{2}$ to 3 $\frac{1}{2}$ inches.
<i>C. micrantha</i> - - -	-	none	none	none	none.
<i>C. officinalis</i> - - -	$\frac{1}{2}$ inch	1 to 3 inches	$\frac{1}{2}$ to 2 $\frac{1}{2}$ inches	$\frac{1}{2}$ to 3 $\frac{1}{2}$ inches	$\frac{1}{2}$ to 7 $\frac{1}{2}$ inches.
<i>C. Pahudiana</i> - - -	none	$\frac{1}{2}$ inch	2 inches	1 to 3 "	1 to 5 inches.

NUMBER and Distribution of the Chinchona Plants in the Government Plantations at Rungbee, on the 1st April 1866.

NAME of SPECIES of CHINCHONÆ.	Number in Permanent Plantations.	Number of Stock Plants for Propagation.	Number of Seedlings or Rooted Cuttings in Nursery Beds for Permanent Plantations.	Number of Rooted Cuttings in Cutting Beds.	Number of Cuttings made during the Month.	Total Number of Plants, Cuttings, and Seedlings.
<i>C. succirubra</i> - - -	606	10,000	23,000	39,581	4,909	78,096
<i>C. Calisaya</i> - - -	none	26	none	131	20	177
<i>C. micrantha</i> - - -	30	2,539	none	2,650	336	5,555
<i>C. officinalis</i> , including varieties	870	10,000	14,100	53,221	12,630	89,821
<i>C. Pahudiana</i> - - -	5,092	none	none	none	none	5,092
TOTAL - - -	6,598	22,565	37,100	95,583	16,895	178,741

TABLE showing the Growth of Chinchona at Rungbee, during the Month of March 1866.

NAMES.	Number.	First Plantation, Altitude 5,321 feet.				Second Plantation, Altitude 5,000 feet.				Third Plantation, Altitude 4,410 feet.				Fourth Plantation, Altitude 3,332 feet.				Fifth Plantation, Altitude 2,556 feet.							
		Date of Planting.	Height in Inches when Planted.	Height on 1st March.	Height on 1st April.	Growth during March.	Date of Planting.	Height in Inches when Planted.	Height on 1st March.	Height on 1st April.	Growth during March.	Date of Planting.	Height in Inches when Planted.	Height on 1st March.	Height on 1st April.	Growth during March.	Date of Planting.	Height in Inches when Planted.	Height on 1st March.	Height on 1st April.	Growth during March.				
<i>C. succirubra</i>	1										29 June	19	29	29		29 July	5	19	19		29 July	6	52	55	2
Ditto	2										29 "	17	23	23		29 "	6	17	17		15 Oct.	10	33	33	3
Ditto	3										29 "	16	25	25		29 "	7	31	31		29 July	5	21	25	4
Ditto	4										29 July	6	12	12		15 Oct.	10	18	18		29 "	9	27	36	5
Ditto	5										29 "	6	22	22		29 "	4	20	20		29 "	5	46	46	6
Ditto	6															29 "	4	15	19		29 "	5	46	46	7
Ditto	7															29 "	3	32	33		29 "	4	47	47	8
Ditto	8															29 "	2	10	10		29 "	4	42	43	9
Ditto	9															29 "	3	29	30		29 "	4	43	43	10
Ditto	10															29 "	3	40	40		29 "	3	30	30	
<i>C. micrantha</i>	1										29 July	5	6	6		15 Oct.	8	17	17		29 "	5	36	36	
Ditto	2										29 "	7	23	23		15 "	6	40	40		29 "	6	32	32	
Ditto	3										29 "	8	10	10		29 July	3	32	32		15 Oct.	6	6	6	
Ditto	4										29 "	8	8	8		29 "	3	7	7		29 July	4	8	8	
Ditto	5										25 "	5	9	9		29 "	3	45	45		15 Oct.	5	11	11	
<i>C. officinalis</i>	1	15 Dec.	8	12	12	15 Dec.	8	12	12		4 "	8	22	22		15 Oct.	4	42	46		15 "	5	13	17	
Ditto	2	15 "	7	10	10	15 "	11	14	14		15 Oct.	6	15	18		15 "	5	35	36		16 "	4	35	35	
Ditto	3	15 "	6	9	9	15 "	11	14	14		15 "	5	19	19		15 "	4	28	28		15 "	5	28	29	
Ditto	4	15 "	6	12	12	15 "	6	9	9		15 "	5	13	13		15 "	5	49	49		15 "	4	34	38	
Ditto	5	15 "	5	13	13	15 "	7	13	13		15 "	5	16	17		15 "	5	41	41		15 "	6	43	48	
Ditto	6	15 "	5	12	12	15 "	6	13	16	3	15 "	5	10	10		15 "	4	23	23		15 "	4	9	9	
Ditto	7	15 "	5	15	15	15 "	6	19	19		15 "	4	13	13		15 "	5	30	31		15 "	5	18	18	
Ditto	8	15 "	4	12	12	15 "	7	16	16		15 "	5	12	12		15 "	4	26	26		15 "	5	17	17	
Ditto	9	15 "	4	12	12	15 "	7	23	23	1	15 "	6	12	15		15 "	4	34	34		15 "	4	14	16	
Ditto	10	15 "	10	15	16	15 "	7	8	8		15 "	5	16	16		15 "	3	31	34		15 "	4	16	24	
<i>C. Pahudiana</i>	1	15 "	5	13	13	15 "	5	14	14		4 July	5	14	14		15 "	7	39	40		15 "	7	9	12	
Ditto	2	28 Mar.	5	7	7	15 "	4	5	5		4 "	5	14	14		15 "	4	32	33		29 July	1	6	7	
Ditto	3	28 "	5	13	13	15 "	4	14	14		4 "	3	23	23		29 July	3	31	31		29 "	2	52	55	
Ditto	4	15 Dec.	2	10	10	15 "	5	18	18		4 "	2	13	13		29 "	2	32	34		29 "	3	44	44	
Ditto	5	15 "	2	8	8	15 "	5	9	9		4 "	3	19	19		29 "	2	48	48		29 "	2	51	56	
Ditto	6	15 "	2	12	12	15 "	5	24	25		4 "	3	20	20		29 "	3	38	38		29 "	1	39	40	
Ditto	7	28 Mar.	3	8	8	15 "	4	9	9		4 "	2	16	16		29 "	3	23	23		29 "	2	45	45	
Ditto	8	15 Dec.	2	13	13	15 "	5	10	10		4 "	2	15	15		29 "	3	31	32		29 "	2	38	37	
Ditto	9	15 "	4	8	8	15 "	2	9	9		4 "	2	20	22		29 "	3	36	36		29 "	1	36	37	
Ditto	10	15 "	2	11	11	15 "	3	9	9		4 "	3	35	35		29 "	3	28	31		29 "	4	35	40	

Darjeeling,
1 April 1866.

T. Anderson, M.D.,
Superintendent, Botanical Gardens, and in Charge of Chinchona Cultivation in Bengal.

OF THE CHINCHONA PLANT INTO INDIA.

— No. 23. —

From *T. Anderson*, Esq., M.D., Superintendent, Botanical Gardens, and in charge of Chinchona Cultivation in Bengal, to the Officiating Junior Secretary to the Government of Bengal.

23 May 1866.

I HAVE the honour to forward the Report on the cultivation of Chinchonæ at Darjeeling, for the month of April 1866.

REPORT of the Cultivation of Chinchonæ at Darjeeling for the Month of April 1866.

THE number of all species has been increased to 192,765 by the addition of 14,024 cuttings to the total number of last month. Fourteen thousand pits have been prepared for the permanent planting of *C. succirubra*, and the putting out of the plants in them had been commenced towards the end of the month. At plantation No. 4, 2,000 pits have been made for plants of *C. officinalis*, and planting was begun.

The seeds of *C. officinalis* received from Ceylon are growing rapidly; those sown in February were two inches in height in April, and the seeds sown in April germinated on the 11th day after sowing.

The weather during the month has been dry and hot; no rain fell between the 3rd and the 22nd, and only 3·7 inches were recorded as the total amount of rain during the month.

The temperature at the different plantations has altered very slightly from the record of March; nights were clear and cold, and in consequence the minimum temperature has been a little lower than in March. The days have been warmer than in March, and thus the mean temperature has been nearly the same as in that month.

The most important event that has occurred has been the flowering of two plants of *C. officinalis* at the Fourth Plantation. The plants have been 18 months in the ground, having been planted on the 15th October 1864; they were about four feet in height when the panicles of flowers first appeared. These are the first Chinchonas that have flowered in this part of India, and their production of flowers is a further proof that the climate of Sikkim is adapted to the growth of Chinchona.

TABLE showing the Temperature of the Month at the different Plantations.

Plantations.	Mean Maximum.	Mean Minimum.	Mean.
1st Plantation - - -	68·50	46·50	57·50
2nd Ditto - - -	70·99	49·40	60·15
3rd Ditto - - -	79·24	52·92	66·08
4th Ditto - - -	Record lost.		—
5th Ditto - - -	84·90	58·00	71·45

TABLE

TABLE showing the Maximum and Minimum Growth during April 1866.

NAME of SPECIES.	First Plantation.	Second Plantation.	Third Plantation.	Fourth Plantation.	Fifth Plantation.
C. succirubra - - -	- none -	- none -	- none -	2½ in. -	½ in. to 4½ in.
C. micrantha - - -	- none -	- none -	- none -	- none -	1½ in.
C. officinalis - - -	½ inch -	2½ inches -	3½ in. to 4½ in.	½ in. to 2½ in.	1 in. to 9½ in.
C. Pahudiana - - -	- none -	½ in. to 1 in. -	½ in. -	½ in. to 1 in. -	4½ in. to 8½ in.

NUMBER and Distribution of the Chinchona Plants in the Government Plantations at Rungbee on the 1st May 1866.

NAME of SPECIES of CHINCHONÆ.	Number in Permanent Plantations	Number of Stock Plants for Propagation.	Number of Seedlings or Rooted Cuttings in Nursery Beds for Permanent Plantations.	Number of Rooted Cuttings in Cutting Beds.	Number of Cuttings made during the Month.	Total Number of Plants, Cuttings, and Seedlings.
C. succirubra - - -	606	10,000	27,000	40,490	4,600	82,696
C. Calisaya - - -	- none -	26	- none -	151	24	201
C. micrantha - - -	30	2,539	- none -	2,986	550	6,105
C. officinalis, including varieties	870	10,000	25,100	53,851	8,850	98,671
C. Pahudiana - - -	5,092	- none -	- none -	- none -	- none -	5,092
TOTAL - - -	6,598	22,565	52,100	97,478	14,024	192,766

TABLE showing the Growth of Chinchonas at the Rungbee Plantations during the Month of April 1866.

NAMES.	Number.	First Plantation, Altitude 5,321 feet.				Second Plantation, Altitude 5,000 feet.				Third Plantation, Altitude 4,410 feet.				Fourth Plantation, Altitude 3,332 feet.				Fifth Plantation, Altitude 2,556 feet.							
		Date of Planting.	Height in Inches when Planted.	Height on 1st April.	Height on 1st May.	Growth during April.	Date of Planting.	Height in Inches when Planted.	Height on 1st April.	Height on 1st May.	Growth during April.	Date of Planting.	Height in Inches when Planted.	Height on 1st April.	Height on 1st May.	Growth during April.	Date of Planting.	Height in Inches when Planted.	Height on 1st April.	Height on 1st May.	Growth during April.				
<i>C. succirubra</i>	1										29 June	18½	29	29		29 July	5	19½	22	2½	29 July	6	55½	56½	1
Ditto	2										29 "	17½	23½	23½		29 "	6	17½	17½	2½	15 Oct.	10½	33½	33½	1
Ditto	3										29 "	16	25½	25½		29 "	7½	31½	31½	1	29 July	5½	25	27	2
Ditto	4										29 July	6	12½	12½		15 Oct.	10	18	18	1	29 "	5	36	36	1
Ditto	5										29 "	6	22½	22½		29 "	4½	20½	20½	1	29 "	5½	46½	51	4½
Ditto	6										29 "	6	22	22		29 "	4	19	19	1	29 "	3	46½	46½	1
Ditto	7															29 "	3½	33	33	1	29 "	4	47	47	1
Ditto	8															29 "	2	10½	10½	1	29 "	4½	43½	44	1
Ditto	9															29 "	3	30½	30½	1	29 "	4	43½	44	1
Ditto	10															29 "	3	40½	40½	1	29 "	3	30	30	1
<i>C. micrantha</i>	1										29 July	5	8½	8½		15 Oct.	9	17½	17½	1	29 "	5½	86	86	1
Ditto	2										29 "	7½	23	23		15 "	6½	40	40	1	29 "	6	32	32	1
Ditto	3										29 "	6	10½	10½		29 July	3	32	32	1	15 Oct.	6	6½	6½	1
Ditto	4										29 "	5	8½	8½		29 "	2½	7½	7½	1	29 July	4½	8½	8½	1
Ditto	5										25 "	5½	9	9		29 "	3	45	45	1	15 Oct.	5½	11	11	1½
<i>C. officinalis</i>	1	15 Dec.	8½	12½	12½	15 Dec.	8½	12½	12½		4 "	8½	22½	22½		15 Oct.	4	46	46½	2½	15 "	5	17½	20½	2½
Ditto	2	15 "	7½	10	10	15 "	11½	14	14		15 Oct.	6	18	18		15 "	5½	36	36	1	15 "	4½	85½	85½	1
Ditto	3	15 "	6½	9	9	15 "	11½	14	14		15 "	5	19½	19½		15 "	4½	28	28	1	15 "	5	29½	29½	1
Ditto	4	15 "	6½	12	12	15 "	6	9½	9½		15 "	5	15½	15½		15 "	5½	49½	50½	2	15 "	4	38	38	1
Ditto	5	15 "	5½	13	13	15 "	7	13	13		15 "	5	17½	17½		15 "	5	41	41½	1	15 "	6	48	50½	2½
Ditto	6	15 "	5½	12½	12½	15 "	6½	16	16	2½	15 "	5½	10½	10½		15 "	4	23	23	1	15 "	4½	9½	19	1
Ditto	7	15 "	5	15½	15½	15 "	6	19½	19½		15 "	4	13	13		15 "	5½	31	31½	1	15 "	5	18½	18½	1
Ditto	8	15 "	4	12	12	15 "	7½	16	16		15 "	5	12½	12½		15 "	4½	26½	26½	1	15 "	5½	17½	17½	1
Ditto	9	15 "	4½	12	12	15 "	7	23½	26	2½	15 "	6	15½	15½		15 "	4	34½	34½	1	15 "	4	16	17	1
Ditto	10	15 "	10	16	16½	15 "	7½	8½	8½		15 "	5½	16½	16½		15 "	3	34½	34½	1	15 "	4½	24	27½	3½
<i>C. Pahudiana</i>	1	15 "	5	13	13	15 "	5	14	14		4 July	5	14½	14½		15 "	7½	40	40	1	15 "	7½	12	16½	4½
Ditto	2	28 Mar.	5	7½	7½	15 "	4	5	5		4 "	5½	14½	14½		15 "	4½	33½	34	1	29 July	1½	7½	7½	1
Ditto	3	28 "	3	13½	13½	15 "	4½	14	14		4 "	3	23	23		29 July	3	31½	31½	1	29 "	2	55½	55½	1
Ditto	4	15 Dec.	2½	10	10	15 "	5	18½	18½		4 "	2	13½	13½		29 "	3	34	34	1	29 "	3	44	44	1
Ditto	5	15 "	2½	8½	8½	15 "	5	9	9		4 "	3	19	19		29 "	3	48½	48½	1	29 "	2½	56	56	1
Ditto	6	15 "	2½	12½	12½	15 "	5½	25	26	1	4 "	3	29½	29½		29 "	3	38	38	1	29 "	1½	40½	40½	1
Ditto	7	28 Mar.	3½	8½	8½	15 "	4	9½	9½		4 "	2	16	16		29 "	3	23½	23½	1	29 "	2	45½	45½	1
Ditto	8	15 Dec.	2½	13	13	15 "	5½	10½	10½		4 "	2½	15½	15½		29 "	3½	32½	32½	1	29 "	2	13	22	1
Ditto	9	15 "	4½	8	8	15 "	2½	9½	9½		4 "	2	22	22		29 "	3	36	36	1	29 "	2½	37	37	1
Ditto	10	15 "	2½	11½	11½	15 "	3½	9½	9½		4 "	3	35½	35½		29 "	3	31	32	1	29 "	4	40	40	1

Darjeeling,
1 May 1866.

T. Anderson, M.D.,
Superintendent, Botanical Gardens, and in Charge of Chinchona Cultivation in Bengal.

— V. —

CHINCHONA CULTIVATION IN THE KANGRA VALLEY (PUNJAB).

— No. 1. —

EXTRACT of a LETTER from Captain *W. Nassau Lees*, LL.D., to the Secretary to the Government of the Punjab.

Sir,

Calcutta, 31 December 1863.

I HAVE received your letter, dated 7th ultimo, with enclosures, from Colonel Lake, and the Deputy Commissioner of Kangra.

3. I would solicit the favour of your directing the local authorities to make over to me 25 acres of the Kusmul plot of reserved land, which the Lieutenant Governor of the Punjab, in your demi-official letter, dated Murree, 31st July last, has permitted me to purchase at the average cost of the sale.

4. Since my letter, however, was written, I have visited the Kangra Valley; and I am able to state that it is of the greatest importance to my experiment to obtain more land adjoining the spot in which I am placed, for I am now completely hemmed in and surrounded by Captain Batt, the Government, and the Nassau Tea Company's lands; and I hope therefore, that if any other forest land can be obtained more suitable for the Holta Tea plantation than that at Kusmul, the Lieutenant Governor will still make over to me the remainder of this land on similar terms, or any others that he may think proper. As a tea planter I can assure the Lieutenant Governor, without fear of contradiction, that it is not well suited for the purposes for which it is now reserved.

5. I have already erected buildings of a considerable extent, all of stone masonry, a hothouse, on the Paxton principle, propagating hot and cool pits 64 feet long, in all about a 100 running feet of glass, besides gardeners' houses, &c., and I am building a dwelling house. I cannot surely remove these buildings. My gardener has left England. He is now at the Botanical Gardens of Ceylon; and will proceed thence to Ootakamand, where it will be seen by the annexed letters that fitting arrangements have been made for insuring his efficiency by instruction in his business.

6. It is true that I have now at Kangra only 30 Chinchona plants, but most of these are stock plants, strong and healthy, of 12 to 16 inches in height, with good solid woody stems; and, with the apparatus which I have prepared on the spot, as soon as the gardener gets to work, he can propagate to the extent of hundreds if not thousands, in a few months. He will, moreover, bring with him fresh supplies of plants from Ceylon and Ootakamand; and, with his Honour's further aid, I have every hope of signal success. I may mention that my very young plants were planted out in the forest, and, without any protection, have been exposed to the heat and rain from April to October—a test of climate to which Chinchonas have not been submitted in any other part of India.

7. As to anyone inspecting my plantation on the part of Government, I can possibly have no objection. I specially solicited the late Viceroy to do so, and undertook a journey of 3,000 miles that I might personally show his Excellency my plantations at Holta.

8. If the Lieutenant Governor would ask permission of the Government of

India for Dr. Anderson to report on the capabilities of the Kangra Valley for Chinchona cultivation, he would confer a signal benefit upon me, and all intending cultivators of the Chinchona plant throughout the Punjab, and I would most willingly submit my plantation to his inspection, or to that of Mr. McIvor, could he be spared from Madras to come round here.

9. I do not, however, think that before my experiment has failed, it is to the interest of Government and of the public that it should be rivalled or opposed. On the contrary, it would seem to be on every ground expedient that my experiment should be an adequate one, and its results widely and speedily felt; and I trust therefore that his Honour will consider himself justified in determining to serve me and to forward my undertaking, without reference to anyone. I forward copies of very kind letters received from Professor Balfour of the Royal Edinburgh Botanical Gardens, from Mr. Thwaites, the Superintendent of the Botanical Gardens, Ceylon, and also an interesting and important correspondence from Java, illustrative of the generous sympathy of the Dutch Government with the Indian experiments, and of the attention and valuable assistance of Her Majesty's consul at Batavia. These letters, in addition to what I have myself stated, will be sufficient evidence to show that I am in earnest, and doing all that the Government itself could do, without subjecting me to the inconvenience and probable heavy loss which may be caused by the delay of further references. It will be seen that I have procured some *C. Calisaya* seeds; and am thus, I believe, the first importer of the seeds of that highly valuable species of the plant into India. I would respectfully add, moreover, that as I am going to carry out my experiment myself, and to place it under the superintendence of a person whom I shall have taken measures specially to qualify for the duty, I am best able to say what assistance I require. This I have already done, and I earnestly hope that his Honour will considerably favour me with an early reply.

10. The Lieutenant Governor will readily understand that if I obtain assistance from Government my experiment will be carried out on a larger and more extended scale than if I am left to carry it on unassisted and alone; and that were Government to open a rival plantation mine must subside altogether, as I could not afford to carry it on with a prospect of reimbursement deferred to a distant future. He will, I hope, then perceive how unfair it would be that I should be led to incur large expenses, under the delusion that I am to obtain Government aid, or to be unrivalled.

11. I am certain that Sir Robert Montgomery will excuse the liberty I take in putting the matter thus plainly before him, for he will doubtless be able, without difficulty, to see that, under the circumstances, delay in ascertaining the position in which my experiment stands may involve me in very serious pecuniary loss.

12. With reference to Kooloo and its capabilities for Chinchona cultivation, as the selection of this valley was a suggestion made by Colonel Lake, I venture to add, without stating other patent drawbacks, that I was informed, when at Kangra, that the rainfall there is only about from 18 to 20 inches, and I have learned since, that the neighbourhood was visited by a snow storm on the 31st of October last, so severe, that 50 natives perished between Kooloo and Lahoul. These facts, if they are facts, would not seem to indicate this locality as the most favourable, in those regions, for the cultivation of an inter-tropical plant; and it is on these grounds, and in the interest of my own experiment, and not with the intention of assailing anyone's character or reputation, that I desire to urge on the Lieutenant Governor that the idea of transferring the experimental cultivation of Chinchonas from the Kangra to the Kooloo Valley be abandoned.

Enclosures in No. 1.

EXTRACTS of Letters from the Private Secretary to his Excellency the Viceroy and Governor General.

My dear Lees,

Holta, 26 October 1863.

THERE is no possibility of H. E. being sufficiently well to-morrow to plant your Chinchona.

Should the rain cease and the morning be quite fine Baring and I will be with you to-morrow at half-past six o'clock.

Very sincerely yours,
(signed) T. J. Hovel-Thurlow.

My dear Lees,

Holta, 1 November 1863.

LORD ELGIN desires me to express to you his deep regret that, after you should have undertaken a hurried journey of some thousands of miles for the special purpose of being on the spot at the time of his Excellency's visit to your Chinchona plantations, the state of his health should compel him to postpone it until some more favourable opportunity.

The interest which Lord Elgin has always taken in the growth of Chinchonas is very great. Years ago, in Java, I accompanied him on a tour of inspection through the Dutch Government plantations in that island, and even then he inquired minutely into the peculiarities of the soil and climate, with reference to the success which might attend the introduction of this plant into this country. From this you may judge for yourself how great is the disappointment which this illness has caused him. He has, however, desired me to describe to him all I saw when you, the other day, so kindly showed Baring and myself over New Quito,* and his Excellency trusts that whenever circumstances may enable him to pay his promised visit, you may be approaching that success which should, and sooner or later must, attend your exertions in this field of improvement to which you have devoted so much of your time and real interests.

Very sincerely yours,
(signed) T. J. Hovel-Thurlow,
Private Secretary.

Royal Botanic Gardens, Edinburgh,
24 October 1863.

Dear Sir,

I HAVE this day secured the services of a gardener for you. His name is John McKay. I believe him to be an excellent gardener. He is sober and steady, and has good testimonials; I have every reason to hope that he will suit you. He is working in the Botanic Gardens here before he leaves, so that he may see everything new in the way of cultivation. I am now expending the 20*l.* you sent for outfit, and passage to London and Southampton. I have written to Mr. Mackintosh Balfour in London, and asked him to arrange about the passage by the steamer of 4th November. I shall attend to your direction as to his calling on Mr. Balfour and Mr. Markham. I suppose that Mr. Balfour will arrange for his remaining at Ceylon for 10 days, before going to Madras and then to Calcutta. I shall give him letters to Mr. Thwaites and Mr. Melvor.

He has signed the contract, and I now transmit it to you. I shall send you an account of the disbursements made on his account.

Our mutual friend, Sir David Brewster, sent a kind note to me in regard of you.

I shall always be glad to aid you, and I shall be delighted to hear of your success in Chinchona and tea cultivation.

Captain Lees.

I am, &c.
(signed) J. H. Balfour, M.D.,
Professor of Botany.

Royal Botanic Gardens, Ceylon,
18 November 1863.

My dear Sir,

I HAVE this moment received your letter of the 9th instant, and, in reply thereto, beg to assure you that it will afford me much pleasure to aid you in your interesting experiment in

* Mr. Thurlow does not mean that I was actually present, as he and Captain Baring were prevented by heavy rain from visiting New Quito on the day fixed, and I was obliged to leave immediately for Calcutta.

in the way you request. I shall not, however, be able to send the plants as soon as you wish, but they could go a mail or two afterwards, at the same time that I shall be sending other cases of Chinchonas for India.

As the expense of cases and carriage to Galle is considerable, I must ask you to place 10*l.* or 12*l.* to my credit at the Oriental Bank Corporation to meet this expense. The balance I will return to you as you may direct.

If the man you mention arrives here, I will give him every information in my power; he should be furnished by you with money for his expenses in getting to our Chinchona garden, and for his board and lodging in the neighbourhood. Coach fare from Galle to Kandy is 5*l.*, and the same back, and from this to our Chinchona garden and back, with expenses there, would cost about 15*l.* So he ought to have at least 30*l.* in his pocket to meet these expenses.

Our excellent Governor, I am sorry to say, is going immediately to England on account of ill health.

Believe me, &c.
(signed) G. W. A. Thwaites,
Director.

My dear Sir,

Batavia, 13 December 1863.

I AM in receipt of your letter of the 1st September, and would have answered it sooner, but have only returned from a trip to the hills, where I have been for a short time. Your letter to Mr. Loudon I immediately sent him. I called on him a few days after, and I am glad to say that, through his influence with Dr. Junghuhn, the superintendent of the Chinchona plantations, I am enabled to send you 100 of the *Calisaya* seeds, which I am sure you will find very welcome. Enclosed you have a letter from Mr. Loudon. I also, at Mr. Loudon's request, send you a copy (translation) of Dr. Junghuhn's letter to him which I am sure you will find interesting with regard to the *Chinchona Pahudiana*.

Mr. Loudon has just been appointed by the King of Holland, a member of Council, and has begged me to request you, in reference to Chinchona seeds or plants, to correspond with Dr. Junghuhn direct, if you will send your letters to me. I will take care they are duly forwarded, Mr. Loudon will still use all his influence with Dr. Junghuhn to assist you as far as possible. I return your letter for Dr. DeVry, who left for Europe sometime ago.

I am no relative of McLachlan of McLachlan. The name of your uncle is well known to me.

Captain W. Nassau Lees, LL.D.
&c. &c. &c.
Calcutta.

I am, &c.
(signed) James McLachlan.

My dear Sir,

Batavia, 14 December 1863.

I WAS duly favoured with your kind and very interesting note of the 1st of September, which I sent Dr. Junghuhn, begging him, if possible, to comply with your request.

He accordingly sent me 50 *Calisaya* seeds, which I enclose, with a translation in extract from his letter, which perhaps may prove to be not without interest. May I join to this a request, which is, that if possible you might provide Dr. Bourne with a small quantity of the seeds. I promised that gentleman to send him 100 seeds, which I have not yet received. Perhaps you might divide again what I might send you or him afterwards.

Wishing you all possible success, I remain with sentiments of high consideration,

W. Nassau Lees, LL.D.,
Calcutta.

My dear Sir, &c.
(signed) A. Loudon.

TRANSLATION.

Dear Sir,

Lembaug, 3 December 1863.

WITH the greatest interest I have perused the letters you have had the kindness to send me with your valued favours of 25th November last, and return them herewith. That the Chinchona of the Neilgherry, cultivated from slips or suckers are so weak (tender), does not surprise me; this I had experienced here since long. Only the Chinchona plants cultivated from seeds become strong trees, and it is a pity that specially the best species (*Calisaya, lancifolia, succirubra*) so very seldom bear flowers and produce fruit. It was just

just yesterday I gathered the first 100 *Calisaya* fruits, of which I send 50 seeds herewith. I don't know as yet how many are in them; should it be more than 1,200 then I can send you next post another 50; they are very rare, and each grain of seed is worth at least 100 florins. I am now erecting a hot-house, intended exclusively to force the *Calisaya, lancifolia*, and *succirubra* trees to produce fruit (in the hot-house).

Do you know perhaps if, and what, the British India Government has answered to the request for *Condaminea* plants?

I read the news, that the cultivation of the *C. Pahudiana* has been suspended in British India (as Sir Nassau Lees writes) just on a day that I could chuckle at it. I had just finished examining one of the oldest of our Pahudiana trees (a slice of the bark of the Pahudiana No. 22, at Tjibodas), and I could smile at it, because I now have the certainty to see the time in which they will be eager to have the much despised and scorned at Pahudiana. Although this tree is still a sapling, and has not yet branches, except on the top; it has already more than 3 p. c. alkaloids, viz. 1.525 quinine and 1.500 Chinchona, which last named turns into quinine when the bark becomes older, as all keen observers say. Two years ago Professor Mulder found in a similar specimen, consequently a much younger tree, 0.9 quinine and 1.3 chinchonine, or 2.2 per cent. alkaloid.

It is clear that the alkaloid basis increases every year; that, however, the development of a considerable quantity of alkaloid in the Pahudiana takes place at a later period than in other specimens, because it is comparatively younger, viz. must by nature grow higher, and, thus not thicken as early as the others.

When you are in the opportunity of speaking to his Excellency the Governor General please bring this under his notice.

I should have sent already my chemical report by this post, but I am still occupied with the leaves of the *C. succirubra*, in which Dr. Anderson asserts to have found quinine. To make my work complete, I will add the result of this investigation to my report. Kindly request the Governor General to appoint somebody to cut off, in my presence, of the same Pahudiana, at Tjibodas, a slice of the bark, and to send it to Batavia to be examined, otherwise the good friends of the Pahudiana will accuse me of mystification.

My compliments, &c.

Loudon.

(signed) F. Junghuhn.

Dear Sir,

Lembaug, 6 December 1863.

I HAVE the pleasure to send you still 50 *Calisaya* seeds to complete the 100 intended for Mr. Lees. The first crop has yielded 1,288. I will hope that also the other 600 fruits may ripen.

The *C. succirubra* leaves really contain alkaloid, viz. 0.520 p. c. of which 0.400 quinine. They are also rich in (Kmalooistofzuur?) and can be made an article of trade, not for preparing quinine but *quinium*.

I should now act in a consequent order if I examined also the leaves of the *Calisaya, lancifolia*, and *Pahudiana*, which contain perhaps also alkaloid, but I think to delay it because the breathing of alcohol and ether for months long begins to disgust me.

Wishing, &c.

(signed) F. Junghuhn.

P.S.—That the leaves of the Chinchona contain alkaloid is entirely a new fact, till now unknown in the science. Dr. Anderson has the honour of the first discovery regarding the *succirubra*: I that of first fixing the quantity. Of the other specimens nothing is known yet.

True copies of Dr. Junghuhn's letters to Alexander Loudon, Esq., Secretary General to the Ned. Indian Government.

Batavia, 13 December 1863.

(signed) James McLachlan.

— No. 2. —

From Captain W. Nassau Lees, L.L.D., to the Secretary to the Government of the Punjab.

Sir,

Calcutta, 28 April 1864.

IN continuation of my letter of the 31st December last, regarding my Chinchona experiment in the Kangra Valley, I beg to report, for the information of

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the

the Government of the Punjab, that Mr. McKay, my gardener, arrived in Calcutta in the end of January, bringing with him a supply of Chinchona plants from Ceylon and Ootakamund, as follows:—

From Ceylon.

24 | C. succirubra, one case.

From Ootakamund.

150 | C. succirubra.

316 | C. Condaminea (very young seedlings in pots).

14 | C. micrantha.

2 | C. Calisaya.

4 | C. Peruviana.

Total 486 | plants, packed in four Wardian cases.

2. Half of the plants from Ceylon died before reaching this, evidently from not having been properly shaded during the voyage, as the plants were planted in four rows, and all those in the two outer rows were dead, while those in the two inner rows were alive and healthy. These plants were remarkably fine—the finest I have ever seen sent round here—averaging from 14 to 18 inches in height, with large succulent leaves; but I think that plants of about 3 to 3½ inches high, if healthy and well established in the cases, are the best for sending long distances by land. They are less liable to damage by shaking, and a greater number may be contained in a small space.

3. The plants from Madras, all except the Condaminea seedlings in pots, and those in one case which met with an accident, arrived in truly splendid order, as fresh as they left the gardens at Ootakamund, and all growing vigorously. Chinchona seedlings are very delicate, and, even at the best season of the year, there is great risk in sending them long journies. They were not looking remarkably healthy when they reached Calcutta.

4. The greatest difficulty, however, was yet to be overcome—the transport of the plants from here to Hoshearpoor, a distance of about 1,300 miles, and from thence through the hills for 80 or 100 miles more. Two of the cases were very large and cumbersome, and it seemed almost impossible to transport them on men's shoulders through a hill country, if the plants survived the long land journey to the hill foot. At the instance of Sir Charles Trevelyan, Mr. Palmer, the agent of the East India Railway, very kindly made special arrangements for the conveyance of the plants the whole way to Allyghur by passenger train, at goods train rates. By this arrangement the gardener was able to travel with the plants, and Mr. Palmer furnished him with letters to the Railway Authorities at the several breaks along the line, to procure him every assistance and to prevent detention. Mr. McKay left Calcutta on the night of the 9th February. At Allyghur, the Indian Carrying Company placed a whole waggon at my disposal, and Mr. McKay proceeded by Dák, awaiting the arrival of the plants at the several stages—Delhi, Kurnal, Umballah, Ludianah, and Jullundhur, at each of which he carefully examined them.

5. The plants arrived at Jullundhur on the 26th February, having been thus 17 days on the journey from Calcutta, and on the same day Mr. McKay reported as follows:—

“The plants arrived here this morning; they do not look half so well as when they left Calcutta, but I think I will get more than two-thirds up. The large case, which looked so well in Calcutta, looks wonderful yet. I have sent them on this evening. I had to get 18 coolies, as I thought it a pity to take them out of the cases after getting them so far on the way.”

6. Much difficulty, however, was experienced in getting the plants through the

the hills to their destination. The coolies several times threw the cases down and refused to carry them any further, leaving Mr. McKay, who was of course unable to speak a word of their language, sitting disconsolate on the side of the hill with his precious plants. By dint of perseverance, however, he safely reached Nassau on the evening of the 1st March, with his five large cases of plants all looking wonderfully well, except that containing the pots of *Condaminea* seedlings. Of these, about 80 per cent. had died on the road, and the remainder looked weak and sickly.

7. Here Mr. McKay allowed the plants to rest for a few days, and on the 7th they were all removed to New Quito, a distance of about five miles, where Mr. McKay pitched his tent and prepared to commence his operations.

8. On an examination of the cases, the following result was obtained:—

NAMES.	Packed in Cases.	Reached alive.	Died.	REMARKS.
<i>C. succirubra</i> - - -	150	117	33	
<i>C. ditto</i> - (Ceylon) -	24	12	12*	* These all died before reaching Calcutta, as explained above.
<i>C. Calisaya</i> - - -	2	2	—	
<i>C. Peruviana</i> - - -	4	4	—	
<i>C. micrantha</i> - - -	14	11	2	
<i>C. Condaminea</i> - - -	316	67	249†	† All seedlings.
TOTAL - - -	510	213	296	

9. Excluding the sickly *Condaminea* seedlings, the 12 *C. succirubra* of Ceylon, neither of which are fairly debitable to the account, it appears that out of 172 healthy Chinchona plants, 146 were landed alive, on a plantation distant nearly 3,000 miles from Otacamund; and when we consider that the greater portion of the distance was a land journey, involving a passage of 80 or 100 miles through valleys and over two high mountain ranges, it must be admitted that the result is extremely satisfactory, and highly creditable to Mr. McKay.

10. Of the site of the plantation Mr. McKay reports:—“It is a most beautiful place, and will do well, I think, for Chinchonas;” and again, “some of the planters here are under the impression that Chinchonas will not grow on fir or pine plantations, but I think they will, for I have found capital Chinchona soil about 200 yards above where my tent is now pitched.”

11. Regarding the state of the plantation when Mr. McKay reached it, I make the following extracts from his letters:—“There are 18 bamboo baskets here, made by Mr. Taylor, for covering Chinchonas when planted out; but they are so wide, they will neither keep out heat nor cold.” “The large pit is perfectly useless for Chinchonas, unless it be altered by making it span-roofed.” “On examining the flues I find they will not do, as the flue of the large pit runs on a level, whereas it ought to have a gradual rise from the fire to the chimney. I also tried the small house; it draws a little, but the smoke comes through the flue into the house.” “I must say the place and everything in it is in a very rough state.”

12. To Mr. Rogers, the superintendent of the Government tea plantation at Holta, I am under great obligations, and I am happy here to record them. Mr. McKay says of him:—“To Mr. Rogers I am greatly indebted for his attention. He has provided me with everything, and asked me to go and live at his house; but I did not wish to leave my plants. I have found him very kind, and he has promised to assist me in all my wants.”

13. Of the number of plants on the plantation, Mr. McKay says:—“I went

to the plantation to-day (5th March) with your assistant tea-planter, Mr. Turnbull. From what Mr. Taylor told me at Jullundhur, I had expected to find more Chinchonas at the place. There are five in pots in the propagating house, and one planted out,* which is almost dead; six altogether, and nine seedlings, of which I could not make out the species.†

14. I have not made these extracts with the object of disparaging Mr. Taylor, who is, no doubt, as good a horticulturist as he is a sharp and intelligent man. He might have succeeded had he devoted himself to the duty; but to manage a Chinchona plantation 150 miles off, with the aid of a native gardener on the spot, is not possible. I saw 12 fine Chinchonas on this plantation in October last, all growing vigorously, and the day I left 16 cuttings were taken; and in chronicling the result as to these plants, and the appliances for their propagation, I desire simply to add force to those arguments before adduced by me, and in which I am supported by Mr. Markham and Mr. McIvor, that the experimental cultivation of Chinchonas in regions foreign to their natural growth is not likely to be attended with successful results, or indeed with any results at all, unless care be taken to ensure that those who are entrusted with the duty have some qualifications for it, and have had fair opportunities of making themselves acquainted with the requirements of the special cultivation these plants require. No doubt, when the cultivation has passed beyond the experimental stage, and a good model plantation has been formed, where private persons may themselves go, or send their gardeners to learn all the details of the cultivation, considerable success may attend their efforts in the rearing of well grown and healthy plants; but I doubt much their success in rearing plants from seeds, or in propagating young seedlings requiring careful preparation of soil, delicate adjustment of temperature, and, above all, the most cautious and judicious regulation of moisture, without proper appliances, and the aid of skilled gardeners.

15. Of Mr. McKay, Mr. McIvor speaks in the following terms:—"I had the pleasure to receive your letter of the 23rd ultimo (December 1863), and a few days after Mr. McKay came from Ceylon. I have shown him every operation as carried on here, and, as he seems an active and intelligent young man, I have no doubt he will be able to carry out all he has seen, more especially as he performed all the operations with his own hands, and consequently is not likely soon to forget them." "I regret that the seeds of the *C. succirubra*, which flowered, are not yet perfected. When they are quite ripe, I shall send you a few in a letter." And Mr. Thwaites, of Ceylon, who speaks in equally favourable terms of him, has solicited his aid as a collector of plants.

16. We have good grounds, then, to assume that the experiment is in proper and careful hands, and that it will receive such attention as to insure for it a fair trial, fairer, certainly, than if Government imported the plants and sold them at half their cost to natives and the European tea planters in the valley. If it succeeds, the Punjab will derive all the benefit that it could do if Government itself undertook the carrying of it out; while, if it fails, it will probably be from circumstances Government could not have controlled.

17. Of his operations since his arrival at the plantation, Mr. McKay has kept me accurately informed; and it will be seen by the extracts from his letters which I append, that he has not been idle. He has planted out eight of his best plants to test the soil and climate; he has propagated 88 plants, layered one, and sown the hundred Calisaya seeds I sent him, and, by the latest reports, all appeared to be doing well. Of the seeds, 75 were received in December. Mr. McKay was not then here, and I would not entrust them to any one else. I therefore took a small stoppered bottle, heated it in the sun, and thoroughly dried it inside by means of a piece of cotton fixed on the end of a stick; I then closely stoppered the bottle and covered the top and neck with sealing-wax. Many people told me I was wrong in doing so, and that the seeds should have ventilation. The second batch of seeds, 25 in number, did not arrive till February, or two months later. They came in a letter, and that I might test both methods of preserving these diminutive, delicate, and precious seeds, I despatched

* This is the plant which was taken down to Holta for the late Lord Elgin to plant. He saw it; but was too ill to plant it.

† They are *C. Pahudiana*, from Java.

despatched them, packed as they came, to New Quito. Of those packed in paper but 4 per cent. germinated in 25 days; while of those which had been sealed up in the bottle for three months after their arrival, 27 per cent. germinated in 15 days. This test, however, cannot as yet be considered a complete one, so I have directed Mr. McKay to report more fully the result as he observes it.

18. Mr. McKay's reports on the weather are such only as he could give without the aid of instruments; but it is satisfactory to observe that he is alive to the necessity of taking such observations. Before, however, his application was received, I had applied to Colonel Norman on the subject, and his Excellency the Governor General having immediately sanctioned my application, the instruments* are now packed and ready, waiting only for an opportunity to send them off. If, therefore, Mr. McKay attends to his instruments with that regularity which is essential to insure an accurate record, besides materially assisting in determining those species for which there are the greatest probabilities of success, I shall be able to furnish Government with a series of meteorological observations of considerable value. The taking of these observations, however, requires some experience, and the utmost regularity and care, and perhaps Mr. McKay will not, at first, be entirely successful, but I am certain he will do his best. He will be instructed to try and train a native to assist him, as, without an assistant, in case of his temporary absence, the observations would be interrupted.

*1 Max. and Min.
Thermometer.
1 Hygrometer.
1 Mountain Barometer.
1 Rain Gauge.

19. From the appearance of the 12 plants I saw at New Quito in October last, I was of opinion that the *Condaminea* variety of *C. officinalis* would ultimately be found to be best suited to the Kangra Valley. This opinion I communicated to Mr. Markham in December last; and Mr. McKay's short experience seems to confirm it. All, however, is yet experiment, and I will not, therefore, venture to express myself confidently on any of the points involved in the inquiry until after next cold weather.

20. In the meantime, I shall furnish his Honor the Lieutenant Governor with monthly tabular statements and half-yearly reports, showing the progress of the experiment, and any other information he may wish to have.

N.B.—I have just time to record the receipt, this day (27th April), of a packet of Chinchona seeds of a most valuable species, the *C. Pitayensis*, from Clements Markham, Esq., of the India Office, and the despatch of the same in a registered packet to my plantations at Kangra. From the high altitude at which this species grows, and the very low temperature to which it is subjected in its natural regions, there is good reason to believe that it may succeed, if any species of Chinchona will succeed in the Punjab. The *C. Pitayensis*, Mr. Markham says, is the true Pitayo bark of New Granada, and these seeds were collected by Mr. Cross, the gardener, whom he employed for that purpose last August. The trees were growing on mountain ridges, or in damp ravines near the city of Popayan, at very great altitudes, where it sometimes freezes. Temperature 30° to 60° Fahrenheit. The bark from the same trees was analyzed by Dr. Jameson of Quito, and yielded 3·2 per cent. of quinine. The Pitayo is a well-known species, and highly valuable bark of commerce, like the red, yellow, grey, and crown barks.

Enclosure in No. 2.

EXTRACTS from the Reports of Mr. John McKay, Head Gardener in charge of the Chinchona Plantation of Captain W. Nassau Lees, LL.D., at New Quito, Kangra Valley, Punjab.

Dated 4 March.

On Saturday I propagated 12 *C. Peruviana* from one of the plants I found here.

(signed) J. M.

Dated 20th March.

I SEND you a report of this week's working. I planted 116 Chinchonas in the nursery. The weakest ones I put in pots in the propagating pit. On the 16th I propagated 23 *C. succirubra*, four *Condaminea*, three *micrantha*, and three *Peruviana*, in all 33, this week's propagation. Some of the cuttings I put in the propagating house, and some I plunged in one of the cases; and I observe that those in the cold case are better and look more healthy than those in the propagating house. On the 19th I planted out eight of the best and healthiest of the *C. succirubra* plants that were in the Ceylon case. I planted them eight feet from the road and eight feet apart near the nursery. I will pay particular attention to the growth of these plants, and see how they like the soil.

(signed) John McKay.

OBSERVATIONS ON THE WEATHER.

At New Quito Chinchona Plantation, from 1st to 31st March.

1st to 7th, fine and sunny; wind south-west. 8th, cloudy; atmosphere very close. 9th, thunder, heavy rain, and violent gusts of north wind. 11th, fair. 12th, cloudy. 13th, heavy rain-fall. 14th, fair; wind north. 15th, thunder and rain; wind north. 16th, thunder, rain, and hailstones. 17th to 21st, fair and sunny; wind north. 22d, thunder and rain; wind south. 23d to 28th, fair and sunny; wind south. 29th, very cloudy, with rain. 30th, cloudy, with strong south wind. 31st, fair and sunny; wind north.

31 March 1864.

John McKay.

CHINCHONA PLANTATION, NEW QUITO.

REPORT on the Number and Condition of the Plants.

Number of new plants	-	-	-	-	-	-	-	213
Number of old plants	-	-	-	-	-	-	-	6
Number of old seedlings	-	-	-	-	-	-	-	9
Propagation for the month	-	-	-	-	-	-	-	88
Number of casualties in old plants	-	-	-	-	-	-	-	6
Number of casualties in cuttings	-	-	-	-	-	-	-	8

The number of casualties in the old plants was caused by heavy rain immediately after they were put in the nursery beds. The rest are all healthy, and I shall have a number of cuttings for this month. I layered a plant of *C. Condaminea* on the 18th of March; it is growing very well, and I think it will be rooted about the 10th of April. The seeds which you sent me last have no appearance of germinating, but 30 of those which were in the bottle (sown on the 20th) are beginning to germinate to-day, being sown 11 days. Immediately on sowing them, I sprinkled the surface of the sand with water, and then covered them with a pane of glass, and as evaporation took place in the soil, it came on to the glass, and from the glass back to the soil again, which kept the soil in a proper state of moisture. They have only been sprinkled twice all the time they have been in the ground. I have sown the remaining 45 seeds on the 26th. I will enter the number of seedlings in next month's report, as I hope they will all show by that time.

31 March 1864.

(signed) John McKay.

NEW QUITO CHINCHONA PLANTATION.

Dated 5 April 1864.

I TAKE the liberty of writing to inform you that, having noticed the Chinchona plants which I had in the nursery becoming very unhealthy, I examined their roots and found that the place was infested with large black ants, which were eating the roots, so I was obliged to lift and re-pot them. My cuttings are looking very healthy. I find that *C. succirubra* cannot bear the heat near so well as *Condaminea*, *micrantha*, *Peruviana*, or *Calisaya*. I also find that Chinchona *Condaminea* is much easier of propagation, and grows much faster than any of the others. The layer of *C. Condaminea*, which was layered on the 18th March, has grown half an inch since.

The

The Chinchona seed is germinating very slow; only eight seeds have germinated out of 30, which were sown on the 20th March, and out of the 25 seeds which were sown on the 9th March, only one has germinated, and they have been treated according to the instructions in Mr. Melvor's pamphlet. The meteorological instruments which I want are a barometer, maximum and minimum thermometers, a hygrometer, and a rain gauge; also two thermometers for the propagating houses. I have not examined many of the hills yet, but what I have seen are very rich in tropical plants, such as orchids and some beautiful ferns; two varieties of *Hoya*, *carnosa* and *lutea* (?); two varieties of *Justicia*, *carnea* and *zebrina*, and a few *Gardenia*. There is one very pretty fern here. It grows in very shaded places, and likes damp, the *Adiantum pedatum* (?). I can only name one of the orchids, which is *Dendrobium moniliforme*. I will know the other varieties when they flower. *Ficus Macrophylla* grows quite common. I have also found one variety of the *Jasminum* species, *grandiflorum*. I will examine the hills as the season advances.

(signed) John McKay.

Dated 11 April.

My cuttings are growing very well, especially *Condaminea*. It forms roots much sooner than any of the other species, and is not so subject to damp or mildew. It also bears the heat of the sun much better. I find *C. succirubra* the most difficult to propagate. It will not bear the least moisture. I therefore keep them in a separate case, and only sprinkle them two or three times a week, while the *C. Condaminea* are moistened every morning and evening in sunny weather. The layer of *C. Condaminea* which I layered on the 8th March is a fine healthy plant, about five inches in height. The seed is germinating very slow. The weather is most unfavourable for Chinchonas. We have had five rainy days out of 11. It rained on the 1st, 7th, 8th, 9th, and 10th.

The eight *C. succirubra* plants which I planted out are beginning to grow a little now. I had to cover the surface of the soil about them with charcoal to prevent the roots from rotting, in consequence of the frequent rains.

(signed) John McKay.

— No. 3. —

MONTHLY REPORT on the Number, Distribution, and Condition of Chinchona Plants on the Plantation of Captain *W. Nassau Lees*, at New Quito, Kangra Valley, on the 1st May 1864.

Species.	Botanical Names.	No. of Plants 1st of last Month.	Number Propagated since.	Casualties.	No. of Plants on the 1st of this Month.
1	<i>C. succirubra</i> - - -	159	43	10	192
2	<i>C. Calisaya</i> - - -	10	10	-	20
3	<i>C. Condaminea</i> (Urit) -	99	52	2	149
4	Ditto (Charg) - - -	—	—	—	—
5	Ditto (Cresp) - - -	—	—	—	—
6	<i>C. nitida</i> - - -	—	—	—	—
7	<i>C. micrantha</i> - - -	23	7	1	29
8	<i>C. Peruviana</i> - - -	10	3	-	13
9	<i>C. Pahudiana</i> - - -	—	—	—	—
10	<i>C. Pitayensis</i> - - -	—	—	—	—
TOTAL Number of Plants - -		301	115	13	403

TABLE II.

MEMORANDUM of the Growth of Eight Plants of *C. succirubra*, planted on the 19th March 1864.

Number of Plants.	Height in Inches when Planted on the 19th March 1864.	REMARKS.
1	12½	In consequence of the unfavourable state of the weather this month, the eight plants of <i>C. succirubra</i> , which were planted out permanently on the 19th March, have grown very little; but since the weather has changed, I water them once a fortnight with liquid manure, which is producing good effects, the leading buds of five plants being fully expanded, and the remaining three are showing signs of growth.
2	12	
3	13	
4	8	
5	15½	
6	11½	
7	9	
8	14	

— No. 4. —

From Captain *W. Nassau Lees*, LL. D., to the Secretary to the Government of the Punjab.

Sir,

Calcutta, July 1864.

I HAVE the honour to forward a half-yearly Tabular Report on the Chinchona experiment I am carrying on in the Kangra Valley, which I trust will prove interesting to the Lieutenant Governor.

2. Mr. McKay found but five plants alive when he reached New Quito. The experiment, therefore, may be said to date from the day he took charge, just four months ago. The abstract result shown is as follows:—

Chinchona plants on the 1st of March 1864	- - -	213
Increase by propagation of plants	- - -	604
Increase by propagation of <i>Calisaya</i> seeds	- - -	40
TOTAL on the 1st of July 1864	- - -	857

2. The largest increase is in *C. succirubra*, and the next in *C. Condaminea*, viz., 318 of the former, and 206 of the latter. These are commercially the most valuable of the quina-yielding species of Chinchona. It will be surprising if the former species succeeds in the high latitude of Kangra; and it is satisfactory to report that the plants are growing steadily, and are very healthy. Of *C. Condaminea* I am very sanguine of success. The plants of this species take root more easily, grow more rapidly than any of the other species, and those on the plantation are in every respect in the highest health. It is probable that *C. Condaminea* will eventually be found the species of the Chinchona plant most profitable to cultivate in the Punjab. At the same time *C. succirubra* and *C. Calisaya* are both thriving vigorously, and as the Government of the Punjab have abandoned all idea of making an experiment of its own, it is my intention to give each species a full and fair trial.

3. Of the 100 seeds of *C. Calisaya* received through the kind favour of Dr. Junghuhn from the Dutch Government, 40 per cent, have germinated, 36 per cent. of the seeds mentioned in a previous report as having been put up in a paper packet, and 41½ per cent. of those which were hermetically sealed. The latter are, moreover, very much stronger plants than the former. A similar number

number of seeds were received at the same time by Dr. Anderson, none of which, I am given to understand, have germinated. The 104 seeds of the Chinchona *Pitayensis*, which were collected by Mr. Cross in August last in New Granada, and which Mr. Markham very kindly sent me last May, have not germinated, and a small number of the same batch of seeds, forwarded to me by Mr. McIvor from Ootakamund, have been equally unsuccessful. The seeds on arrival looked good, and after examination through the microscope were pronounced to be so by Dr. Anderson. It is much to be regretted that they have not succeeded, as from the great altitude at which this species of the plant grows, viz. 7,000 to 8,000 feet above the level of the sea, it would be peculiarly adapted to the higher latitudes of the Kangra Valley.

4. This season, I am sorry to say, has been most unfavourable for all agricultural and gardening operations in the Kangra Valley. During the months of May and June, the valley was visited by severe thunder and hail-storms which did great damage. One storm was severe enough to have destroyed all young plants of any kind that were planted out; yet the eight *C. succirubra* plants which are planted out in the open air lived through it, though nearly all their leaves were stripped off by the violence of the storm. Another enemy the planted-out plants have had to contend with was a species of large ant, which infested the spot where they were first put out, and compelled Mr. McKay to lift and re-plant them all in another place. These accidents have checked somewhat the growth of the plants, and it is most encouraging to record that in spite of such serious drawbacks, with the exception of *C. micrantha* and *C. Peruviana*, they are all healthy, and now growing vigorously, especially *C. Condaminea*.

5. Regarding one experiment with this latter species, Mr. McKay writes on the 2nd May, "I measured the young plant of *C. Condaminea*, which I propagated from a layer. On the 1st of this month it was eight inches in height, with rich dark green leaves, the length of which is $4\frac{1}{2}$ inches by $1\frac{3}{4}$ inch breadth, and it is showing buds from every joint. I will be able to take 20 cuttings off the old or parent plant this month. I experience no difficulty in propagating *C. Condaminea*. The cuttings delight in frequent syringing with very little air during the warm part of the day. In the afternoon I syringe them, shut the cases with a little sun heat, and by this treatment the cuttings are growing very satisfactorily."

6. In consequence of the terminus of the railway having been advanced from Bolundshuhur to near Delhi, the person appointed to receive the meteorological instruments which were despatched from here, had moved on, and the instruments were left with the station master for upwards of a month. They have since, however, been forwarded; but the detention is extremely unfortunate, as through it we have lost the observations which, as this season of the year is most trying to young Chinchona plants, would have been of very great value.

7. It will be seen from the remarks of Mr. McKay's Tabular Report that the plants of both *C. micrantha* and *C. Peruviana* are suffering so severely from the extreme heat that their leaves are turning yellow, and dropping off. I am in hopes that this is due to the unusually unfavourable season they have had this year in the Kangra Valley. From this cause all the tea plantations have suffered severely. At Nassau, not a lb. of tea was made in May and for the first half of June; so probably these plants will recover themselves*. I doubt whether the months of May and June are favourable for propagating young Chinchona plants; but it is the cold rather than the heat of the Kangra Valley that we have most to dread, and if that does not affect any of the species when planted out in the open air, I shall be very sanguine of success. At the same time it cannot be expected that all species of the Chinchona plant will flourish in regions of such high latitude, and if I succeed in acclimatizing two or three of the most valuable of the 10 or 12 species of Chinchona which have been imported into India, I shall have accomplished a feat. In attempting to do so, however, much labour and money may be lost in cultivating species for which
the

* See last letter of Mr. McKay, received when this was in the press.

the climate will ultimately prove uncongenial. Indeed so much money has been already laid out in importing plants that have died on the way, and in erecting glass-houses, propagating pits, &c., &c., that I begin to feel very anxious regarding the result, and would therefore again venture to solicit the attention of his Honor the Lieutenant Governor to the 18th paragraph of my letter, dated 8th September last, regarding the efficient carrying out of this national and important experiment.

8. I mean to plant out a few *C. Condaminea* plants, as soon as I have plants sufficient to enable me to do so; but for the present I intend to devote all my energies to propagating as large a number of stock plants as possible. By the end of this year I hope to have from 5,000 to 6,000 plants of all species, and 8,000 to 10,000 in March next. In the rains of next year I intend to plant out, at ten feet apart, about 30 acres, and, if I can get the land, 200 acres the year following.

9. Mr. McKay, besides being most attentive to his duties, seems to take a warm interest in his work, and to be fully alive to the great importance of the experiment with which he has been intrusted. He still receives every assistance and attention from Mr. Rogers, to whom, for his timely help, I am much indebted.

10. I forward extracts from Mr. McKay's weekly reports. It may appear that these extracts are too copious; but should the experiment be successful, they will prove of considerable value as a guide to future experimentalists, and cannot now fail to be interesting, though without further experience, it would not be safe to give publicity to them.

Enclosures in No. 4.

EXTRACTS from the WEEKLY REPORTS of Mr. *John McKay*, Head Gardener, in charge of the Chinchona Plantation of Captain *W. Nassau Lees*, LL.D., at New Quito, Kangra Valley, Punjab.

New Quito, 19 April 1864.

My cuttings are all growing and looking very healthy, the plants are also growing a little now, and next month, I expect to get about 200 cuttings off the old plants; the number of cuttings for this month, up to the 16th, is 44, and 8 seedlings. The seeds are germinating very slowly, but I think the most of the *Calisaya* seeds in the bottle will germinate; the 25 seeds which you sent in the paper, I am much afraid will not germinate, as there are no signs of them, and they are in the soil since the 9th of March. I find that *C. Condaminea* likes this climate better than any of the other species; it grows much faster, and is much more easily propagated; it also delights in frequent syringing, while *C. succirubra* is most sensitive. If the cuttings get the least excess of moisture, they are certain to damp off and rot, and must be kept in a cool shaded place. *C. micrantha*, *Peruviana*, and *Calisaya* are equally as hardy as *Condaminea*, but do not grow so fast.

The layer of *C. Condaminea* which I layered on the 18th of March, is a beautiful healthy plant, about seven inches in height, and I intend layering some more, when I have them large enough.

(signed) *John McKay*.

New Quito, 25 April 1864.

I AM glad to inform you that the Chinchona cuttings and plants are growing fast and look promising; the old plants are shooting out fine healthy buds, which will be ready for cuttings in May. I have some plants of *C. Condaminea*, which were propagated in March, two inches in height now; they were not half an inch in height when propagated.

I am very busy with the building and repairing of the propagating house. I will have it finished about the end of May. There are two houses attached to the north side of the propagating house, and by your permission, I will take them down, and build a potting shed to the east end of the propagating house, and have the two to communicate with one another, so that when the cuttings are made and put into the pots, they can be removed from the potting shed into the propagating cases, without exposing them to the sun, or external atmosphere, of which they are most sensitive.

(signed) *John McKay*.

New Quito, 2 May 1864.

It gives me much pleasure to inform you that the *Calisaya* seeds are daily germinating, and look very healthy. I have been very anxious about those seeds on account of their being so long without germinating; but I see an account in the Blue Book of seed of *Chinchonas*, sown at Ootakamund, which were from 64 to 68 days sown before germination took place, which makes me hope for nearly all the *Calisaya* seed to germinate. With reference to the effects of this climate on the various species of *Chinchona* which are here, I find that *Chinchona Condaminea* forms roots in three weeks, while all the other species are from four to five weeks in forming roots, and are subject to damp and rot, especially *succirubra*; it is one of the most difficult to propagate by cuttings. I cannot say anything about *C. Calisaya*, as there are only two plants of it, which had been very weak, but they are recovering now. I have been able to get one cutting off one of the plants, which has every appearance of forming roots. I regret that I did not get stronger plants of *Condaminea* from Ootakamund, as I am certain, from what experience I have, that *Condaminea* is more adapted for this climate than any of the other species, and I think it will ultimately prove to be so. On the morning of 1st May, there was a fearful thunder-storm, accompanied with showers of large hail stones, which has greatly damaged the eight plants of *C. succirubra*, which were planted on the plantation; it destroyed nearly all their leaves.

(signed) *John McKay.*

New Quito, 7 May 1864.

THE *Chinchona Pitayensis* seeds were sown on the 6th of May, immediately after receiving them. They all looked healthy and fresh. I will watch all seeds and plants most carefully and attentively, and depend upon it I will do all that can be done for the success of this experiment, with which I am entrusted.

I send for your information this week's proceedings and a report of the *Calisaya* seedlings, which are looking very healthy, with the exception of those which were in paper.

The method which I mean to adopt with regard to the hardening or the tempering of young plants, before planting them out, is, first, I intend, by your permission, to build a cold frame, made of wood, and, as the plants begin to grow in the cutting pots, I take them out, and pot them into three inch pots; then put them into this cold frame, and keep them quite close for eight or ten days; then the air is admitted gradually until such time as they get established in the pots, and begin to grow a little; then they can be exposed day and night until such time as they are planted permanently in the plantation. I am still busy with the building of the propagating house, and the most particular work, such as making and planing the wood for the sashes. I do it all with my own hands, as the carpenters here are very rough workmen, and quite ignorant of such work.

I have also commenced clearing a site for a house 50 yards above the large propagating house; but the soil is so good that I am unwilling to waste so much of it; it is just the sort of soil we grew our pine-apples in Scotland, fine fibrous turfy loam; and I find that the whole of the ridge right up the hill is equally good.

(signed) *John McKay.*

New Quito, 14 May 1864.

THE cuttings and young rooted plants are all healthy, and the old plants are growing vigorously. The weather is keeping very unsettled and wet. The eight plants of *Chinchona succirubra*, which are planted outside, are still growing and look healthy, although all their leaves were completely destroyed by hail on the night of the 1st; indeed, I am surprised to see them alive, as their roots have been soaking in rain-water since the 1st of this month. The *Calisaya* seedlings are growing and look very healthy. I have every seedling in a three-inch or thumb pot in a compost of leaf mould, brick-dust and sand, equal parts of each. I sprinkle them in the morning and afternoon of every day immediately before sunrise and sunset, and they get as much air and light as they can bear without flagging.

(signed) *John McKay.*

New Quito, 21 May 1864.

I HAVE the honour to forward for your information the weekly report for the third week of May, and I am happy to state that my cuttings and all the old plants are looking very satisfactory and promising. The *Calisaya* seedlings are growing, and look healthy; not one of the remaining seeds has germinated this week.

I have received the two thermometers and 150 seeds of *Chinchona Pitayensis*, which reached on the 20th, and were sown on the 21st May.

Before I received your instructions not to lift the *Chinchona* plant which had been taken from here for Lord Elgin to plant, I am sorry to state that I raised it on the 28th of March, as I thought it was dead; but I root-pruned it at once, and put it into a flower-pot in a compost of equal parts of leaf, mould, and sand, and it is showing signs of life now; so I

think it will recover, and if you wish I will put it out again. This week I have examined all the land right from the top of the hill on both sides, and I find that the soil and aspect on this side of the hill is far superior to that on the opposite side, for the cultivation of the Chinchona plant or any other plants.

(signed) *John McKay.*

New Quito, 31 May 1864.

I do not know where the Chechean lands are, but I will obtain such information from the Commissioner, and visit the place at once; however, I think it will be better to get all the land in this dale at once, because I am sure that the land here is as suitable for the cultivation of the Chinchona plant as any other part of the valley.

I have got all the outside work of the propagating house finished. I have had to replace all the beams and repair all the sashes, and when it will be finished I will get on much faster with the propagation, as it will be a more suitable place than where I have been propagating.

(signed) *John McKay.*

New Quito, 4 June 1864.

THE Chechean lands only contain 26 acres. I have examined it all, and there are only about 18 acres out of the 26 which I have selected as being fit or suited for the cultivation of the Chinchona plant; the soil is very good, with a north-west aspect; it joins the Koosmal land on the top of the hill, and is well sheltered on all sides. This day, the 4th of June 1864, I have seen 100 acres of land measured for you; 82 acres, 1 rood, 35 poles in Koosmal, and 17 acres, 2 roods, 5 poles in the Chechean lands; in all 100 acres. The timber on the Koosmal land has been greatly cut down of late, and this day I have put a stop to it, and will not allow any of the trees which are cut to be carried away, until I receive instructions from you how to act in this case.

The title deeds of the land are to be made out as soon as possible, and the Deputy Commissioner is to give me whatever assistance I may come in need of.

The soil in the Koosmal land is all very good, with the exception of a few acres, which are very stony. The seeds of *C. Pitayensis* are showing no signs of germinating yet.

My cuttings and all the plants are looking very satisfactory, as also are the *C. Calisaya* seedlings.

(signed) *John McKay.*

New Quito, 11 June 1864.

THE Chinchona cuttings and plants are all looking very healthy and promising, as also are all the 40 Chinchona Calisaya seedlings; there is no sign at present of any more seedlings. The Chinchona seeds which were sown on the 10th of May last, are showing no signs of germination, and this day, the 11th of June, I have examined the seeds in the pots, Pitayensis, and I am much afraid that very few (if any) will germinate, as they appear to have lost their germinating power. I send you a few which I have taken out of the seed pots, and you will see that they are quite useless, although in appearance they looked healthy and fresh when sown.

I am sorry that I have no melons ready to send; I have had 12 plants planted outside, and had them all destroyed on the 1st of this month by a most destructive hail-storm, which has greatly damaged some of the tea plantations here. Some of the stones which I have measured were $1\frac{1}{2}$ inch in diameter; the storm continued for about one hour. I have sown some more melon seeds, and will force them on as fast as I can.

I have three tea plants here, which I have reared from three seeds, which were sown on the 9th of last March in damp sand above the flue in the propagating house; they are now 7 inches high and very healthy; when I raised them to put them into pots, I found that the stem or tap root was two inches too long for the pot; I therefore took the knife and cut about two inches off the length of the tap root, which has not checked the growth of the plants in any way, and I find that where the root has been cut, is now shooting out fine nourishing fibrous roots.

(signed) *John McKay.*

New Quito, 20 June 1864.

THE propagating house is now about finished, with the exception of the propagating cases, which will take some time, as I cannot get a proper instrument to cut the glass with.

The cuttings and plants are all growing well, as also are the Calisaya seedlings.

There is no appearance of any of the other seeds germinating as yet, and no more of the Calisaya seeds have germinated since I wrote last.

(signed) *John McKay.*

New Quito, 25 June 1864.

THE weather is very hot and very trying on the young Chinchona cuttings. There are none of the Chinchona seeds showing signs of germination, and I am sorry that the Chinchona Pitayensis seeds were sown so soon in the season, as I think they would have done much better if they had been kept and sown in the rainy season, as all seeds germinate sooner in moist weather than in hot dry weather. This week, on the evening of the 23rd, the wind had been very strong, and broke a branch off a large pine tree, and unfortunately it fell on one of the eight plants which were planted outside, and completely smashed it; fortunately it was the weakest and smallest plant.

(signed) John McKay.

New Quito, 8 July 1864.

THIS week I have been examining as minutely as possible all the land which you have purchased from Government for the cultivation of the Chinchona plant; it is all good land, and I think 90 per cent. of it will do well for the cultivation of Chinchonas; indeed, it is all far superior to the 10 acres which are at Quito, both as regards aspect and soil; there are only about six acres at Quito, which I think will grow Chinchonas, the remaining four acres contain a very stiff clayey soil, which cakes quite hard after a shower of rain.

The weather is still dry and warm, and if rain do not come soon, all vegetation will suffer severely.

(signed) John McKay.

New Quito, 4 July 1864.

I AM happy to inform you that the plants of the *C. micrantha* are recovering rapidly since the rains set in. *Peruviana* are still unhealthy; but I hope the moisture of this weather will have the same effect on them.

(signed) John McKay.

— No. 5. —

From Sir Charles Wood to the Government of India.

8 August 1864.

1. I TRANSMIT, herewith, the following pamphlets for the use of Dr. Anderson, and others who are engaged in Chinchona cultivation at Darjeeling in the Kangra Valley, or in Assam:—

Thirty copies of Mr. Howard's analysis of the third remittance of Chinchona bark and leaves from the Neilgherry Hills.

Fifteen copies of Dr. Junghuhn's Reports on the Chinchona plantations in Java, for the years 1860 and 1861.

Ten copies of a statement by Dr. Junghuhn, superintendent of Chinchona plantations in Java, with some explanatory notes by Mr. Markham.

Six copies of a preliminary guide to the cultivation of quinine, by Dr. Junghuhn.

2. It will be found that the system of cultivation adopted by Dr. Junghuhn is opposed to that which has been so successful on the Neilgherry Hills; but at the same time it is well that cultivators in India should be possessed of all available information, whether it be in the form of records of examples to be copied, or of mistakes to be avoided.

3. Mr. Howard's report of his analysis of the third remittance of Chinchona bark from the Neilgherry plantations is exceedingly satisfactory, and gives promise of future very important results to be derived from this cultivation.

4. The Chinchona experiment in the Kangra Valley, which has been commenced by Captain W. Nassau Lees, is both interesting and important; for it will test the suitability of a region at a considerable distance from the tropics for the growth of the Chinchona plant. I trust that it will meet with the success which the public spirit and enterprising perseverance of that gentleman fully deserve.

— No. 6. —

From Sir *Charles Wood* to the Government of India.

28 February 1865.

1. I HEREWITH transmit 15 copies of a pamphlet on the cultivation of quinine in Java and British India, by Dr. De Vry, which has been translated from the Dutch. Dr. De Vry was officially connected with the Chinchona plantations in Java for several years; and he has since visited the Neilgherry Hills. His remarks on the comparative merits of the methods of Chinchona cultivation adopted respectively on the Neilgherry Hills and in Java are, therefore, of great value.

2. Copies of the pamphlet should be supplied to Dr. Anderson, Captain W. Nassau Lees, and others who may be interested in the cultivation of Chinchona plants in Bengal, the North-West Provinces, or the Punjab.

— No. 7. —

From Captain *W. Nassau Lees*, L.L.D., to the Secretary to the Government of the Punjab.

Sir,

Calcutta, 29 April 1865.

I HAVE now the honour to submit, for the information of his Honor the Lieutenant Governor of the Punjab, my annual report on the cultivation of the various species of the Chinchona plant which I am carrying on in the Kangra Valley of the Punjab; and as the success that has attended my operations affords good grounds for hope that the cultivation has passed the experimental stage, I solicit his Honor's permission first to take a brief retrospect of my operations from their commencement.

2. The first two cases of Chinchonas, containing 55 plants, were obtained from the Governor of Madras in June 1862. The season was very unfavourable, and all died in transit except two. These lived for a short time, but soon shared the same fate. The next two cases were imported in February 1863. The weather was cold, and through the assistance of Drs. Anderson and Jameson, whose gardeners took care of the plants *en route*, the one from Ootacamund to Calcutta, and the other from Calcutta to Saharanpoor, I was more successful. About two-thirds of these plants arrived safely at Kangra. The next two cases imported were kindly brought round from Madras for me by the Honourable Mr. Harington in August of the same year; but they all died in transit.

3. The failure in transporting the plants imported in June 1862 and August 1863, was due, no doubt, to the extreme heat of the weather, and though no European gardener went in charge of them, I doubt if any care would make it safe to transport Chinchonas such a journey, at that season of the year. It should not therefore be attempted.

4. About 30 plants of those imported in February 1863, however, were reported to be alive and healthy, and this number would have sufficed to commence the experiment had I had the means of giving it a trial. I asked for the services of Mr. Taylor, a landscape gardener employed by the local committee of Jullundhur, for six months; but though the Lieutenant Governor consented, the committee were unable to accede to my request; and I hesitated to go to the expense of importing a gardener from England until I had more certain proof that Chinchonas would grow in a latitude so far north of their natural habitat, as the Kangra Valley. I had, therefore, to rest content with a native gardener and the promise of an occasional visit from Mr. Taylor, who I appointed superintendent. But differences, unfortunately, almost immediately arose between him and the local authorities, which resulted in his abandoning the experiment to the native gardener, and returning to Jullundhur, leaving his frames and cases at one of the Nassau Tea Company's estates, and his plants planted out in the open forest five miles off. In September 1863, Mr. Taylor returned to the plantation, and cleared a few acres of land round and about the plants.

Difficulties of transporting the plants.

Difficulties of management.

plants, and erected propagating pits and a hothouse; and in October of the same year I myself visited the place, with the view of showing it to the Governor General, the late Lord Elgin. I found 12 plants alive and tolerably healthy, and as they had been planted in the open and left wholly to nature, I thought it a hopeful sign of future success. I was obliged, however, very shortly to return to Calcutta. At the same time also Mr. Taylor proceeded to Jullundhur, the 12 plants being left to weather the cold as they had the hot season, uncared for, except by a lazy native gardener.

5. Success under such circumstances would have been miraculous, and this I very early foresaw; but a proposition was before the Lieutenant Governor to experiment with Chinchonas on Government account, and much time and temper was lost in discussing whether Government should support my experiment, or import plants from Madras in quantities, and distribute them to the public, native and European, at half their cost. This I strongly objected to, as unjust to myself, and as an unscientific mode of initiating an important national experiment; and in my letter to your predecessor's address of September 1863, on this latter point, I thus expressed myself:

"To effect this, it appears to me that, firstly, I should have at least 150 acres of land at my disposal. Dr. Anderson's nurseries, alone, now cover about 15 acres; but when we came to planting out, which is the only true test of climate, much larger space is required, and for this purpose a forest of between 7,000 and 8,000 acres have been made over to him. What quantity of land Mr. McIvor has I do not know; but I believe he planted out 500 acres this year. Secondly, a skilful gardener specially qualified for directing the experiment, should be obtained this cold season from England. He should stay a week at Ceylon, and then go on to Madras; and proceed at once to Ootacamund, where he should remain a month, at least, under the instruction of Mr. McIvor, for the purpose of making himself acquainted with Mr. Markham's system, as carried out with such eminent success by that gentleman. He should bring with him from there a fresh supply of strong and healthy plants to Calcutta, which should be at once sent up to Kangra, not later than February 1864. The gardener should then proceed to Darjeeling and remain a fortnight on Dr. Anderson's plantation, to enable him to compare the results of the different treatment of both these experiments, and from thence, about the latter end of March, he should proceed to Kangra. By such an arrangement, the Punjab experiment would gain the benefit of all the experience already obtainable in India, in the prosecution of this highly important experiment."

6. The course above sketched, excepting the visit to Darjeeling, was strictly carried out by me. An excellent gardener, Mr. John McKay, who had been employed by the Dukes of Buccleuch and Sutherland, was engaged for me by Professor Balfour of Edinburgh. He left England early in November 1863, and after staying 10 days at the Chinchona plantations of Ceylon, and three weeks with Mr. McIvor, at Ootacamund, he arrived here by the last steamer, in January 1864, bringing with him five Wardian cases of plants, one from Ceylon, and four from Madras.* The plants from Ceylon were the finest I had seen come round here, being from 12 to 13 inches in height, with large succulent leaves; yet not having come round the whole way with Mr. McKay, half of them died for want of proper shading on the voyage. But this misfortune was not a source of regret, as it prevented my making the mistake of sending Mr. McKay to Darjeeling, instead of direct to Kangra, in charge of his plants. With the exception of one case said to contain 316 *Condaminea* seedlings, which having barely rooted, were hardly fit to be transported such a journey, and another which met with an accident, all the Madras plants were in splendid order, and when they reached Calcutta, were growing vigorously. Mr. McKay's difficulties, however, had yet barely commenced. He had to carry his plants from Calcutta to Hoshiarpour, a distance of about 1,300 miles, and from thence, over three ranges of hills, to the foot of the snowy peaks of the Himalayas. For about 400 miles of this distance, moreover, the plants had to be carried in rough bullock carts, and for the last 100 miles through the hills by coolies. Some of the cases were large and very heavy, and many times the coolies threw them down, declaring their inability to

Engagement of Mr. McKay, and his arrival with the new stock at Calcutta.

		* From Ceylon.
24	C. succirubra, one case.	
		From Ootacamund.
150	C. succirubra.	
316	C. Condaminea (very young seedlings a quarter of an inch high).	
14	C. micrantha.	
2	C. Calisaya.	
4	C. Peruviana.	
TOTAL	- 486	Plants.

proceed further. By patience and perseverance, however, they succeeded, and on the 1st March 1864, Mr. McKay, with the five Wardian cases, reached his destination.

7. The following Table shows the result of his journey as regards the plants he had charge of—

NAMES.	Packed in Cases.	Reached Alive.	Died.	REMARKS.
<i>C. succirubra</i> - - -	150	117	33	* These all died before reaching Calcutta, as explained above.
<i>C. succirubra</i> (Ceylon) -	24	12	12*	
<i>C. Calisaya</i> - - -	2	2	—	
<i>C. Peruviana</i> - - -	4	4	—	
<i>C. micrantha</i> - - -	14	11	2	
<i>C. Condaminea</i> - - -	316	67	249†	
TOTAL - - -	510	213	296	† All seedlings.

Arrival at New Quito.

8. On reaching New Quito, Mr. McKay found but six of the old plants and nine *C. Pahudiana* seedlings alive; and, as these he set aside, and I afterwards gave them to Mr. Taylor, the experiment may be said to have commenced on the 1st March 1864, with the 213 plants which then reached the plantation alive.

Difficulties of climate.

9. After allowing the plants to remain in the cases for a little time to recover from the effects of their long journey, he planted most of them out in nursery beds: but in 10 or 12 days they were attacked at the roots by a species of large red ant, which killed a few of them and greatly retarded the growth of others. This compelled him to lift the whole and re-pot them, and soon afterwards the weather became so cold and stormy, and the plants suffered so severely, that by the end of the month there was hardly a leaf left upon one of them. Mr. McKay began to lose heart, but he did not despair: he carefully cleansed and pruned his plants, kept them in a close moist atmosphere, on a bottom heat of 70 Fabr., and on the sixth day he had the satisfaction to find them beginning to shoot, and in a month his plants were again green, fresh, and growing vigorously.

10. On the 19th of March, by my instructions, eight of the strongest and most healthy plants of *C. succirubra* were planted out in the open air, without any protection from the weather. These were also destined to experience rough treatment. They had hardly been 10 days in the ground before rain set in with unusual severity. Day after day, and night after night, it rained almost incessantly, until the soil became so saturated with moisture that the roots of the plants began to show symptoms of rot. Charcoal was put thickly about the roots to preserve them, and the rain abating the plants were saved; but they had no sooner rallied a little, than the valley was visited by a series of hailstorms so severe that very serious damage was done to the tea plantations in the neighbourhood, and indeed to all vegetation in the valley, while every leaf was stripped off the eight unfortunate Chinchona plants which had been planted out in the open. These trials were disheartening in the highest degree; nor were they destined yet to cease. The natural consequence of the overfall of rain during the months of March and April was that, although ordinarily few months in the year pass at Kangra without some rain, not a drop fell during half the month of May and the whole month of June. The heat was excessive, and about the middle of June became so intense, that it was found impossible to keep the temperature below 90° in the cases. This caused the plants generally to droop, and the leaves of *C. micrantha* and *C. Peruviana* to turn yellow and to drop off. The aspect of affairs was dim and discouraging, and had the drought continued very much longer it would, no doubt, have given rise to serious apprehensions for the success of the experiment. But the beginning of July ushered in the long-

looked-

looked-for rain-clouds, whose refreshing showers imparting new life and strength to the drooping plants, they soon assumed their natural and peculiarly beautiful green and fresh appearance; *C. micrantha* and *C. Peruviana* began to put forth new leaves; and all the plants to grow more vigorously than they had ever done before.

11. Nor was climate the only difficulty I had to contend with. Up to the present, to the few acres of land on which I had erected my propagating pits and glass houses, and laid out nurseries, I had no title, nor could I by any means obtain an acre of land to rent or to buy from Government or from any one else. The natives were averse to Europeans obtaining a footing in the valley, and I almost despaired of getting sufficient land to make even an experimental plantation, when at this juncture the Lieutenant Governor came to my aid and granted me 100 acres of the Government reserves, at the average cost of the auction sales of the year.*

Difficulties of land.

12. In December 1863, through the kind favour of Her Majesty's Consul at Batavia, I received 100 seeds of *Chinchona Calisaya* from the Dutch Government of Java. These I had to keep till Mr. McKay arrived. I put 75 in a stoppered and sealed bottle, and the remainder I kept loose in a paper envelope. Hermetically sealing seeds was an experiment which most people whom I consulted were of opinion would fail; but it would seem to have answered well, as of the seeds so treated 31, or nearly one-half germinated, while of the others nine, or little over one-third, germinated. The plants from the former, moreover, are reported to be far better plants than those from the latter. The first were sown on the 20th and the latter on the 26th March. The bottled seeds began to germinate on the 11th day, and the others not till the 17th or 18th day. Of the seeds of this species sent, at the same time, to the Government plantation at Darjeeling, viz., 200, only nine, or 4½ per cent. germinated; of 100 seeds sent to the Darjeeling Chinchona Association none germinated; while at Kangra 40 per cent. were obtained. The result is worth recording, equally as regards the packing of seeds, and as being highly creditable to Mr. McKay. In May last, Mr. Clements Markham very kindly sent me 104 seeds of *C. Pitayensis*, which had been collected in New Granada in August 1863 by Mr. Cross, and subsequently a few more of the same batch of seeds were generously presented to me, from his own allowance, by Mr. McIvor. They were at once forwarded to New Quito, but none of them germinated. The same result was obtained by Mr. McIvor and Dr. Anderson, so it may be assumed that these seeds, having been nearly a year out of the ground, they had lost their power of germination. For my experiment the failure of these seeds is peculiarly unfortunate, for, besides some *Pitayo* barks being commercially as valuable as the best red bark, as this species of Chinchona grows at an altitude of from 7,000 to 8,000 feet, it would probably be very suitable for localities in the high latitudes of the Punjab. The seedlings grown from the 40 *Calisaya* seeds which germinated are now strong and healthy plants, after having given 170 per cent. of cuttings.

* Vide Appendix.

Seeds.

13. Since July last, nothing having occurred to interrupt the progress of the experiment, the plants have been growing steadily; and, considering the very limited number of stock plants on the plantation, and the length of the winter at Kangra, propagation has been going on rapidly. The growth of the eight plants planted out, though it has been regular, has not been equal, owing, probably, to all the plants not having been of equal strength when first planted out. One plant, No. 4, was crushed by the fall of a tree, and supposed to be completely annihilated; but after two or three months the roots threw out fresh shoots, and it is now a healthy plant again.

Growth of the plants.

14. The following Table shows the growth of these plants from the 19th March, the date on which they were planted out, to the 19th of December, by which it will be seen that four have attained a height of 2 feet, 2 feet 2 inches, 2 feet 3 inches, and 3 feet:—

	Height in Inches on the 19th March.	April.	May.	June.	July.	August.	September.	October.	November.	Growth in December.
1	12½	-	13½	14	14½	14¾	15½	16	16½	0
2	12	-	12½	13	15	17	21	23	24	75
3	13	-	13½	15½	17	20	27½	29½	32½	25
4	8½	-	8½	-	-	-	-	4	4½	0
5	15½	-	16½	17	20	24½	31½	33	35½	42
6	11½	-	12½	14	15½	18	19	20	21	25
7	9	-	9½	10	11	12½	16	18	18½	0
8	14	-	15	16	17	17½	23	25	26	75

15. The growth of the plants was most active during the months of August and September; in the month of November it was fair average, and almost ceased in December. In January, February, and March, the plants have not grown at all, so we may set down eight as the number of growing months, at an elevation of 4,500 feet in the Kangra Valley, and the average growth of strong and healthy plants in their second year, probably, at two inches a month.

Increase by propagation.

16. The rate at which propagation has been going on is shown in the following Table, and I would call attention to the extraordinary increase of *C. succirubra*, which is admitted to be the species most difficult of propagation, being nearly 2,500 per cent. A rate of increase of nearly 2,000 per cent. was attained by Dr. Anderson with *C. Condaminea*, but in his second year, his rate of increase with *C. succirubra* for the same period being a little short of 500 per cent. It might have been considerably accelerated at Kangra; but the plants that are to be planted out next rains have not been touched for some time in order to increase their strength and vigour:—

	March 1864.	April.	May.	June.	July.	August.	September.	October.	November.	December.	January 1865.	February.	March.
<i>C. succirubra</i> - -	129	192	304	447	641	929	1,293	1,486	1,664	2,025	2,223	2,463	2,793
<i>C. Calisaya</i> - -	2	20	19	60	60	60	58	58	61	73	84	96	118
<i>C. Condaminea</i> - -	67	149	215	273	379	481	622	727	807	934	1,044	1,132	1,262
<i>C. micrantha</i> - -	11	29	37	48	60	64	68	68	70	75	75	75	75
<i>C. Peruviana</i> - -	4	13	23	29	40	42	46	44	44	49	49	49	49
TOTAL - - -	213	408	598	837	1,180	1,576	2,094	2,383	2,636	3,156	3,475	3,815	4,297

Experiments in planting out.

17. Early in November I directed Mr. McKay to plant in the open air some *C. Condaminea* plants, as the severity of the winter months at Kangra was the test of climate most to be dreaded in the Kangra Valley. Mr. McKay objected that it was too late in the season, fearing that as the plants had not been "hardened off," so sudden a change of temperature as from 80° to 50° Fahr., would be too great to subject them to. He, however, planted out 25 plants on the 23d November. This was many more than I had intended, as one-fourth of the number would have equally well sufficed for an experiment, of which he had so little hope that in reporting upon it, he said, "I actually thought they would all die." They did not die, however, nor suffer in the slightest, and these plants have now again commenced to grow. Three healthy young plants, of about five inches in height, one of *C. micrantha*, and two of *C. Calisaya*, were similarly planted

planted permanently in the open air on the 6th of February, and up to date they are reported to be looking promisingly.

18. Thus of the 36 plants planted in the open, not one has perished from either the effects of the climate nor from any other cause, the only ill effects of the cold observed being that the frost burnt the tips of some of the old leaves of the eight *Succirubra* Chinchonas; but this did the plants no harm. Mr. McKay, however, reports the occurrence of an atmospheric phenomenon on the 1st February last, which is worthy of note, and as it is very curious I give it in his own words: "A fearful thunder and hail-storm passed over the valley on the 1st instant. It continued for about half-an-hour. There must have been something injurious to vegetation in the atmosphere at the time, as some of the leaves of my Chinchona plants (under glass) turned quite black. They were quite green an hour previous."*

Results of the same.

19. Appended to this Report will be found some meteorological observations; but I regret to say that they are not so complete as I could wish. The instruments for observation were, on my requisition, *at once* placed at my disposal by his Excellency the Governor General, but they did not reach Mr. McKay till late in the season, and the barometer being one which he was not accustomed to, he was some time in making himself acquainted with its use. Early in December, too, his maximum and minimum self-registering thermometers met with an accident and were broken, and those despatched from Calcutta to replace them, were sent by the Transport Company to Kooloo, and he has not yet received them. Mr. McKay has taken very great and praiseworthy pains to carry out my instructions in respect of these observations, which, *if accurately taken*, will undoubtedly be of the highest scientific interest; and next year it is hoped that better success will attend his efforts in this very important part of the experiment.†

Meteorologica. Observations.

20. The propagating pit being now overcrowded, 300 young *C. succirubra* plants were planted in nursery beds early in March last, and up to date they are reported to be doing well.

Removal into nurseries.

21. Of buildings there are now at New Quito a propagating house 50 feet by 10 feet, with flues for artificial heat; a greenhouse 20 feet by 10 feet, which will be enlarged this year, and used as a propagating pit also; a comfortable dwelling-house, with three inner rooms, 14 feet square, and three verandah rooms, 10 feet square; a godown 50 feet by 10 feet, which can be converted into a propagating pit if required; barracks for 50 coolies, besides stables, cow-houses for collecting manure, servants' houses, &c., &c. All of these buildings, except the last-mentioned, are of stone masonry, glazed and slated, and will suffice for the plantation for several years.

Buildings.

22. In December last his Honour, the late Lieutenant Governor, visited and inspected the plantation, and in a private letter to me he expressed himself well pleased with all he saw at New Quito. He had some doubts, however, as to the suitability of the site selected for the plantation, and suggested the advisability of trying experiments with the plants at different altitudes. I consequently at once instructed Mr. McKay to leave a few plants in pots with some of the tea planters, whose plantations were variously situated; but he was unwilling to trust his valuable plants out of his sight, lest they should be neglected or stolen (in which, perhaps, he was right), and the difficulty of getting more land in the neighbourhood of the plantation prevents me from at present doing much towards following out his Honour's suggestion. I hope, however, with the help of the present Deputy Commissioner, who has paid great attention to horticulture, and who himself takes a very lively interest in this cultivation, to be more successful by-and-bye.

Visit of his Honour the Lieutenant Governor.

23. And here I may take the opportunity of expressing my obligations to Sir Robert Montgomery; first, for the interest he has throughout expressed in the success of my experiment; secondly, for permitting me to obtain 100 acres of the Government reserved land at the average cost of the auction sales held in the valley;

Obligations acknowledged.

* Colonel Gastrell, Boundary Commissioner of Bengal, has drawn my attention to a somewhat similar phenomenon, which is mentioned in Mr. Thos. Hopkins' book on winds and storms, as having occurred in Lombardy. In the midst of summer, a cold wind swept down from the Alps and through the valley, depriving the leaves of all the vegetables of their moisture and turning them quite black, as if burnt to tinder.

† Vide Col. Gastrell's letter, with Appendices.

valley; and, thirdly, for liberally sanctioning a grant of 2,000 rupees of public money in aid of the buildings I had erected.

Visit of Major Elphinstone, the Deputy Commissioner.

24. In the early part of this month, the Deputy Commissioner made a tour in the direction of Holta; on the 8th instant he visited New Quito, and on the 9th he wrote to me as follows:—"I visited all the plantations in company with Captain Duff, who showed me everything he could. Mr. McKay was very civil, and seems to get on famously. Nothing could be healthier or more promising than his plants, and the large ones, which had remained out during the winter, were making vigorous shoots, and will be six feet high this year. There is no doubt, in fact, that Chinchonas will get on capitally at Kangra, though they require very delicate treatment at first."

Reasons for prolixity.

25. The foregoing remarks embody the history, if I may so call it, of the first Chinchona plantation established in the Punjab during the first year of its existence, and I trust that the very great national importance of this experiment, will be deemed a sufficient excuse for my having dwelt at some length on the subject. It may, perhaps, be thought that in some respects I have entered somewhat too much into detail; but I have done so advisedly. From a perusal of those paragraphs of this report in which I have described the very great difficulties the young plants had to do battle with, first with red ants, then with rain-torrents, then with violent and tempestuous hail-storms, then with severe drought and the burning sun of a tropical climate, and finally with the bitter cold winds and sharp frosts of a sub-alpine region, it might be assumed that the Kangra Valley is in no way a suitable locality for attempting the cultivation of Chinchonas. But I do not take this view of the case. The conclusion I arrive at from a review of these facts is one far more encouraging to me and Government, viz., that the Chinchona plants which were permanently planted out in the open air, *C. succirubra* and *C. Condaminea*, having passed through these very severe tests of climate, unchecked and unharmed, and being now healthy, vigorous, and growing plants, these two highly valuable species, at least, are far more hardy than was at first anticipated, and that the results of this experiment, so far, give good promise that ultimately they may be successfully cultivated in very many localities on the slopes of the Himalayas, not as exotics or hothouse plants, but as garden shrubs and forest trees.

Results of the experiment.

26. Hitherto an equable temperature has been considered, above everything, essential to the success of all Chinchona cultivation, but it will be seen from the tables annexed that the variation in temperature at New Quito is extremely great, and that in the midst of winter (the 23d of November last) twenty-five young plants of *C. Condaminea* were suddenly, and without any preparation whatever, removed from a glass house at a temperature of 80° Fahr. to the open air at a temperature of 50° Fahr.; and on the 6th of February one of *C. micrantha* and two of *C. Calisaya* were similarly treated without suffering in the slightest degree from the extreme change. "Up to date," says my superintendent in a late report (1st April), "they are looking most satisfactory and promising." The plants could hardly have been submitted to a severer test, and the result, I venture to think, is the very strongest proof of the hardiness of these plants, when well-cared for and properly treated. Hitherto, again, it has been supposed that an extraordinary rain-fall was necessary to the luxuriant growth of all Chinchonas; but it would seem that excess of moisture, with *C. succirubra* at least (unless perhaps in very friable or granular soils and remarkably well-drained localities) is as much, if not more, to be feared than excess of drought. This peculiarity has been noticed also by Mr. McIvor, so it may be considered established, I think, that if Chinchonas grow most luxuriantly in regions subject to the influence of a full discharge of tropical rain, they are extremely sensitive of an excess of moisture at the roots, and consequently require a free and open soil and a well-drained locality. And to this point attention is especially necessary, for the fact is at once suggestive of the proper mode of treating seeds and very young seedlings, viz., the moistening of the soil rather by the indirect process of evaporation than by the more direct process of the syringe. More Chinchona plants, I venture to think, have been killed by injudicious watering than by any other means.

Climates suitable for *C. succirubra*.

27. Again, though determined to give all the valuable species of Chinchonas trial at Kangra, I must confess that I was not sanguine of success with *C. succirubra*.

rubra. In the Chinchona regions of South America, this species is found only within two or three degrees of the equator, and there, according to Mr. Markham, frequently, if not generally, at elevations below 5,000 feet, while the "New Quito" of the Kangra Valley, though not above 4,500 feet in altitude, is in latitude $32^{\circ} 7' 8''$. The appearance of the plant itself, moreover, with its very large, succulent, and bright green leaves, is suggestive of tropical affinities. I was prepared, therefore, from the first, for doubtful success, if not positive failure, with this most valuable species, resting my hopes almost entirely on *C. Condaminea*, to which species I thought the climate of the Kangra Valley, if suitable for any species of Chinchona, would ultimately prove the most congenial. And in this opinion I was confirmed by my superintendent, who at first reported that he found *C. succirubra* the most difficult to propagate, and *C. Condaminea* the easiest. But in those days he used to lose ten per cent. of his cuttings, while in these days he does not lose one per cent., and from his last weekly report I make the following extract:—"All my plants and cuttings are in a flourishing state and look promising, particularly *C. succirubra* and *C. Condaminea*. The former, I am happy to state, much more so than I at first anticipated; but I think now it will turn out to be the most valuable species we have at New Quito." I am still of opinion from the general appearance of the plant, and from the condition of all the Chinchonas I myself saw at New Quito, that *C. Condaminea* will eventually prove a more hardy plant than *C. succirubra*; but it is certainly most encouraging and most gratifying to find the latter species, the bark of which is commercially so much more valuable than that of any of the other species of Chinchona, and which, from its greater size, must be so much more profitable to cultivate, affording such very fair promise of being successfully acclimatized in a region so very remote, and in a latitude so far north of its natural habitat as the Kangra Valley.

28. As regards the site of "New Quito," as mentioned above, the late Lieutenant Governor thought a better one might be selected; but experience has not shown, I think, the present site to be objectionable. The beginning of the season of 1864 was quite exceptional; and all the tea plantations which are situated in the open plain suffered quite as severely as my Chinchona plantation, which is situated in an enclosed and very lovely dell. The following description, by Boussingault, of the climate of Riobamba, says Mr. Howard, under the head of *C. succirubra*, in his *Nueva Quinologia de Pavaon*, will therefore illustrate the requirements of the vegetation of the species, and these details may not be without their use in connection with the present attempt to localize the *Chinchona* in mountain ranges in India.* Riobamba itself is situated in an arid plain, surrounded by a grand amphitheatre of snow-clad mountains, amongst which the names of Tunguragua and Chimborazo are most familiar to Europeans. This vast amphitheatre of snows, which circumscribes the horizon of Riobamba, offers continual opportunity for the most varied observations. It is curious to notice the aspect of those snowy summits at different hours of the day, and to see their apparent height vary from one moment to another through the atmospherical refractions. With what interest do we not observe, in so limited a space, the production of all the grand phenomena of meteorology! Here an immense horizontal cloud, of those which De Saussure has defined with so much exactness under the name of parasites, girds the middle of one of those elevated trachyte cones, and keeps its position without dispersing through the violence of the winds. In a little time the lightning darts from this mass of vapour, the hail and rain inundate the base of the mountain, whilst the snowy summit, inaccessible to the tempest, is illuminated by the sun. In another part is seen a cupola resplendent with ice, whose projection on the deep azure of Heaven permits us to distinguish its most delicate outlines. The atmosphere appears pure, transparent as the most diaphanous crystal, when, beholding attentively, we suddenly perceive that this snowy peak is becoming covered with a cloud in the form of a light veil, which seems to emanate from its bosom, as if it discharged smoke. This cloud has not completed its formation when it disappears, to reproduce itself immediately, and again to vanish. Such an intermittent formation of cloud is a phenomenon very frequent in the snowy sierras, and is particularly observed

* Geografia del Ecuador, p. 331.

in the fine season, and always some hours after the culmination of the sun. In these circumstances the snowy mountains may be compared to condensers, elevated towards the higher regions of the atmosphere to renew freshness and dryness to the air, and thus in this manner is restored to the superficies of the earth the water which had been diffused through the atmosphere in the form of vapours.

"These plains, surrounded by snowy mountains, present the most lugubrious aspect when a constant wind brings moist air from the warm region. Then the mountains cease to be visible, and the horizon is covered with clouds, which appear to touch the earth. The weather continues cold and damp, since the rays of the sun cannot penetrate the thick mass of vapours, so that there is nothing but a continuous twilight, the only one which is known in the tropics, since in the equatorial region night succeeds suddenly to day, and the sun appears to be extinguished in its setting."

29. Now we have, at New Quito, if not all, many of the features of climate and scenery here depicted. We have the amphitheatre, though on a smaller scale; the snow-clad mountains of the great Chumba, a range of the Himalayas perhaps little inferior to the ranges of the Andes in the immediate neighbourhood of Riobamba; and we have all those grand phenomena of meteorology which so interested and delighted M. Boussingault, in common with the great Humboldt, and many other scientific travellers. In addition, we have a hill torrent dashing through the very centre of the plantation, forming countless cascades as it leaps over massive boulders some 15 or 20 feet high, impregnating the atmosphere around with the moisture of its spray, and effectually draining the surrounding slopes throughout the period of the rains. It will be seen also, by the above extract, that this species of Chinchona in its natural home is no stranger to those torrents of rain, and terrific storms of thunder, lightning, and hail-stones, with which the Kangra Valley is sometimes visited, and which are indeed incident to all regions in close proximity to perpetual snows, and in India to many others far removed from them,* so that they need not give occasion to serious alarms. It is true that Mr. Spruce thinks that Mr. Howard was misled by M. Villavicencio in recommending a climate like Riobamba for the cultivation of *C. succirubra*, which, he says, requires a warmer atmosphere; but the broad facts remain, that eight plants of this species withstood the severest season we have had at Kangra for many years, and are now flourishing young trees, and that the stock has been increased by propagation at the rate of nearly 2,500 per cent. in 10 or 12 months, which go a good long way to confirm the opinion of this eminent authority. Of *C. Condaminea* Humboldt says, that it is exposed to a mean temperature of 15° to 16° Réaumur, or 5° to 6° Fabr. higher than *C. succirubra*. It would certainly be desirable to experiment with the several species of Chinchona at different elevations, and a few plants of both species have already been placed out some 500 or 600 feet higher than the present garden, to whose progress careful attention will be paid. *C. Condaminea* will, I doubt not, flourish at higher elevations still; but with *C. succirubra* I am disposed to go lower instead of higher, and am not prepared at present to risk many of my plants by approaching nearer the regions of severe frost than the present site.

Propagation by cuttings.

30. And, as experiment, judiciously and carefully carried out, should be one of the first objects of every superintendent in the present stage of the cultivation of Chinchonas, I may here allude to a point which has had some influence on the propagation of plants in Java, and which does not appear to be yet quite settled, viz., the best mode of taking cuttings from Chinchona plants. The slips from which Mr. Junghuhn propagated his plants, to use his own words, were "twigs cut close under the leaf-knobs, which should not be of greater length than, as a maximum, half a foot." He admitted, however, his coadjutor, Dr. de Vrij, says, "that such slips produced plants that could not withstand any baneful external influence," and the Doctor adds, "it is a pity that after so well founded an observation he did not proceed to discover the cause of such a fact by making certain experiments, for had he done so, he

* One tea plantation, I am aware of in Cachar, was literally so cut to pieces by a hail-storm last year that it produces little or no tea.

he would certainly have discovered, as Mr. McIvor did, that his slips were too large, and that the increase of quinine plants can be, *par excellence*, effected by means of slips, provided the latter are taken as small as possible." Mr. McIvor, as stated by Dr. de Vry, has adopted the latter method, and with the greatest success. Mr. McKay has tried both methods, and his experience is the same as that of Mr. McIvor on this point. He says, "the wood best adapted for cuttings are young tender shoots, one-half to three-fourths of an inch in length, with stems of about an eighth of an inch in diameter. Cuttings of this sort form roots much quicker, and are less liable to damp and rot than large succulent cuttings." Dr. Anderson, up to the present, has adopted the same system of propagation; but he has apparently arrived at an opposite conclusion, as from his report for the month of January last, I observe that he does not mean to continue it after he has attained 20,000, or a propagating stock, of each species. "These stock plants," he remarks, "will be allowed to grow for some time before cuttings are taken from them to form bark-yielding plants as I am convinced that it is better to wait a short time for vigorous shoots than to swell up the monthly return by weak, ill-formed cuttings, whose slowness of growth will never be compensated by their number."

31. It is very desirable to ascertain if the opinion on this important point, expressed by Dr. Anderson in the last sentence of his remarks here quoted, will be borne out by experience, and I have, therefore, instructed Mr. McKay, while pursuing his own system, to ascertain the fact by actual experiment with one or two plants.

32. In my Report of July last I said that I hoped to plant out 30 acres of Chinchonas this year; but the results of the chemical analysis made by Mr. Howard and Dr. de Vry on the bark of young Chinchona plants last year* have satisfied most people that, if ultimately Chinchona will be grown in forests, the proper method at present to adopt is to grow them in gardens as tea plants are now grown in Assam and at Kangra. An early yield will thus be obtained, which will enable private persons and joint stock companies to undertake the cultivation as a highly profitable speculation. To do this, however, on an extended scale will require many hundred thousands of plants, and necessitate the superintendent devoting all his energies, for this year at least, to propagation, which has unfortunately already been checked by preparing some plants to plant out two or three acres. Dr. de Vry, I observe, objects to the propagation of Chinchona by seeds, and finds fault with the late Mr. Junghuhn for doing so in Java, instead of propagating by slips, to which method, he says, a preference was given over seeds by Mr. McIvor; but here Dr. de Vry has certainly fallen into error, for Mr. McIvor did not propagate by slips, I apprehend, from choice, but rather of necessity, and if Mr. Junghuhn made a mistake in propagating from seeds it was a mistake which Mr. McIvor has been doing all in his power to place himself in a position to repeat, and which I should most gladly follow had I the means. But the first year's flowers with Mr. Junghuhn, and the first and second year's flowers with Mr. McIvor, I believe, withered away without giving any result, and I am not aware that seeds of any species of Chinchona have yet been produced in India. The mistake Mr. Junghuhn made, I think, was not in propagating from seeds which, as soon as they can be obtained in quantity, must, of necessity, supersede slips, but in the tenacity with which, to the neglect of *C. Calisaya* and *C. succirubra*, he persisted in extending the cultivation of *C. Pahudiana* beyond all limits, after he had been assured, on the very highest authority, that that species, if not altogether worthless, was the next thing to it; and in wasting his valuable time in controversial attempts to support an opinion with chemical analysis had already demonstrated to the public was erroneous. Nor is it, in the case of Dr. Junghuhn or Chinchona cultivation alone, that practical results have been marred from the necessity of supporting a theory or opinion once advanced or denied by a man of science. The progress of tea cultivation in India was arrested and thrown back at least 10 years by the same cause a quarter of a century ago. It is their liability to such misfortunes wherein lies one of the greatest weaknesses of experiments of this nature when undertaken by governments; it is its absence which constitutes in a

Chemical analysis
of Howard and De
Vry.

great

* Vide *Pharmaceutical Journal*, June, July, August 1864; also *Revue des Deux Mondes* for the Colonies.

great measure their greater strength when undertaken and carried out by private enterprise, I think, therefore, that the very highest praise is due to Mr. McLvor, not for filling hothouses and nursery beds with millions of seedlings which he can neither use nor sell, but for having left the beaten track, and by endeavouring to prove to the public that Chinchona plantations may, within reasonable time, yield a very large return to the capital expended upon them, thus stimulate the cultivation of these valuable plants by private enterprise.

Tea.

33. In addition to his Chinchonas Mr. McKay planted last season five maunds of tea seed, and besides fencing in all his beds, and demarcating his boundaries with thick-set hedges of tea, he will prepare an experimental garden of this plant, the cultivation of which, I venture to think, has by no means reached the highest practicable stage of development. He has already made some experiments both in sowing and planting, and is satisfied with them; but more definite results are necessary before reporting upon them.

Nurseries of other plants.

34. He is further making a nursery of all the plants and trees in the neighbouring hills, and reports that he has already about 1,000 plants in it, and this nursery I hope to improve by obtaining for it some valuable forest trees from Australia and South America. Some seeds of a rare species of melon, which Mr. McKay brought with him from the Duke of Buccleuch's, were sown last year, but the plants were all destroyed by a violent hail-storm. Some strawberries also of a fine kind were planted, but I have no report of the result. His Chinchona nurseries he is shading by a trellis work to be covered with vines, which, as admitting more air and sun light, will be a better shade than grass *choppers*. The vine grows wild at New Quito, and when up there I brought down a specimen of the wood, which is now in the Botanical Gardens of Calcutta, as thick as my arm. It is also to be seen growing luxuriantly in the Government garden, but I was told that the fruit never comes to maturity, being always destroyed by the heavy rains. I shall watch, therefore, this and the other experiments which are in progress at New Quito with interest. The climate of the Kangra Valley is very peculiar; there may be seen the fruits, flowers, shrubs and trees of many and far apart climes flourishing in close proximity, and I am confident that many others, that would be highly appreciated by the people, could be easily introduced and naturalised were a little care and attention paid to their cultivation. The mulberry is already to be found along the borders of the Government tea plantation, and I have instructed Mr. McKay to grow it largely, with the view, when Chinchona cultivation is far enough advanced to allow of leisure for attending to it, to introduce the silkworm. I observe it stated that the plant will not flourish at Holta, that insects destroy it; but I am not so advised from the place itself.

Extension.

35. I observe, the late Lieutenant Governor, in recording a minute on his visit to New Quito, calls it a "small experimental plantation of Chinchona," on a "small piece of land." I have as yet little land, and this may prevent me from extending the cultivation when I am prepared for it; but for the rest everything, if I am rightly informed, is comparatively more forward than at the Government plantation at Darjeeling, which has been established a year longer. The cultivation at Darjeeling was commenced, on the 15th June 1863, with 211 plants of all species, and on the 1st of April 338 more were received, making a total of 549 imported plants to work upon. On the 15th June 1864, or at the expiration of the first year, this number had been increased to 2,545. The Kangra experiment was commenced, on the 15th March 1864, with 213 plants of all species, and on the 31st of March 1865, or at the expiration of the first year, Mr. McKay had 4,297 plants of all species, and might have had twice, if not thrice, the number, had he not set aside some of his plants for planting out.

36. In every respect I have reason to be satisfied with Mr. McKay, who has, under many difficulties, not only discharged his duties with attention and the strictest integrity, but has evinced an intelligent and lively interest in the success of the important experiment he has been entrusted with.

Conclusion.

37. I cannot conclude this, my first annual report, without expressing my deep sense of the encouragement and support given to me by Her Majesty's Secretary of State, Sir Charles Wood, in the frequent mention he has made of my

my struggling experiment in several public despatches, and for the numerous works on Chinchonas, including Mr. Howard's beautiful *Nueva Quinologia de Pavon*, which he has from time to time directed to be forwarded to me.

To Mr. Clements Markham also I am under the very greatest obligations. From the first he has taken the warmest and most lively interest in the success of this experiment, and it is mainly due to the encouraging letters I have received from him that I was induced to persevere with the cultivation up to the point it has attained, through the many obstacles I have had to contend with.

I have the honour to be, &c.

(signed) *W. Nassau Lees*, Captain,
Chinchona Planter.

APPENDIX.

REMARKS on the Propagation of Chinchona by Mr. *John McKay*, Superintendent of Capt. *W. Nassau Lees'* Plantation, "New Quito."

I NOW beg to submit a few practical remarks on the propagation and cultivation of the Chinchona plant, which, I trust, will prove interesting to you; but, as my experience in the cultivation of these valuable plants has only been for 12 months, I acknowledge that I have much to learn yet, and therefore I do not presume to give in these remarks a complete guide to the requirements necessary for the proper treatment of this plant in its different stages of growth.

When I commenced the experiment here, the loss in cuttings amounted to 10 per cent., and now I do not lose one per cent.; the great loss at first was owing to my ignorance of the climate.

One plant worthy of notice, with reference to the eight plants of Chinchona *succirubra*, which were planted in the open air in March 1864, is, that the stems of the plants grown since they have been planted here are considerably thicker in proportion than the old stems, and their leaves are much larger and more succulent than the old ones. This I conclude to be a striking proof of the suitability of the climate for the cultivation of the Chinchona plant; but if this estate had been a little more distant from the snowy ranges of the Himalaya Mountains, the increase by propagation would be much more than what it has been. My proximity to the snow is doubtless a great hindrance to propagation in winter, as the climate here is greatly influenced by the snowy ranges; and hail-storms, which are the only adversaries that the Chinchonas will have to contend with here, are very destructive to all vegetation during the months of February and March.

I have now commenced to line out the land and make pits for the reception of the plants that will be planted in the rains. I have terraced about half an acre, as I want to see whether the plants will make better progress in the terraced lands than in the land as it naturally is.

In collecting cuttings great care should be taken to placing them in a moist, shaded place, until they are ready to be put into the pots; a flower-pot, with damp moss in the bottom, is the best way to keep them. The wood best adapted for cuttings are young tender shoots, one-half to three-fourths of an inch in length, with stems of about one-eighth of an inch in diameter. Cuttings of this sort form roots much sooner, and are less liable to damp and rot, than large succulent cuttings; in preparing them for the pots they should be carefully examined, to see that there are no insects on them. To insure success, each cutting, before it is put into the soil, should be pressed firmly three or four times (the cut end) against the side of a new and dry flower-pot, so as to absorb the juice which flows from the wound, and which prevents mildew and rot; the cuttings should be examined carefully, and re-potted into fresh soil every morning until the fifth or sixth, after which time they may be considered on the safe side.

Propagation by cuttings.

The soil which I have used, and in which I have found the cuttings to root freely, is a compost of three-fourths of sand to one-fourth of pounded bricks, and a sprinkling of leaf mould; but the sand should not be too fine, as the cuttings root more freely in an open soil.

Cuttings should never be put into new pots, because the pots extract and absorb the moisture out of the soil, and, consequently, the cuttings flag or droop, a thing that is very injurious to the cuttings, and should always be prevented if possible; therefore, all new pots should be soaked in water for half an hour, and then be allowed to dry slowly in the shade.

To obtain well-rooted plants, it is essential that the pots with the cuttings be placed on a bottom of heat of from 70° to 75° Fahr. in a close moist atmosphere, for a few days, then air should be admitted gradually; they are syringed overhead twice a day, mornings and evenings, and the atmosphere in the propagating house should be always kept moist by syringing the walls and floor.

After the cuttings are well rooted they should be potted off into three-inch pots, in a compost of fine black loam and sand, about equal parts of each, with a sprinkling of fine sifted manure and brick-dust; they are then well watered, and placed in a close warm atmosphere for five or six days, during which time they are syringed mornings and evenings, and carefully shaded during sunshine. After they are established in pots air is admitted freely, and as much light as possible, and carefully watered, but never overhead; the soil in which the plants are growing should always be kept free and open, by turning up the surface with a small pointed stick three or four times a month.

Propagation by buds.

This is no doubt a good system of propagation, as it increases the number of plants more rapidly; but buds require more care and attention than cuttings or seedlings; they also take more time to form roots, and do not grow half so quick as rooted cuttings.

The way in which I prepare the buds is, I allow the plants for that purpose to attain a height of from five to six inches. I then cut them in the centre, close above the joint or node. I then take the point of the shoot for a cutting, and cut the stem between each joint, and split each down the centre. I then press each bud three or four times against the side of a dry flower-pot; they are then placed in the pots, the buds being merely covered with soil; they are then placed in the cases, and treated as cuttings are. It is of great advantage to have the leaves attached to the buds, because they form roots much sooner, and are not so liable to rot.

Propagation by layers.

This is a very slow system of propagating the plants, but a sure way to obtain fine large ones, as the layer is nourished and growing from the parent plant while it is forming roots.

The principle of layering which I adopted is a little different to that generally practised, as I found that when the layer was removed from the parent plant to be potted, it was very much checked by being raised out of the soil. To obviate this, the plants to be layered (if in pots) I plunge in soil up to the rim. I then take a four-inch pot, well drained, and fill it with soil, the same as that used for cuttings, and plunge it half into the soil at a proper distance from the plant to be layered; then the stem of the plant is cut through a joint, and a thin piece of dry brick is put into the slit, and left there for half a minute or so to absorb the juice which flows from the wound; the layer is then carefully bent into the soil in the flower-pot, and then the pot is covered with a small mound of soil, covering the layer with about half an inch of soil above where it has been cut. In placing the layer in the pot care must be taken to keep the two cut parts separate.

After the layers are well rooted, they should be carefully cut from the parent plant, and left in the pots in which they have been layered for two or three weeks, and afterwards they can be re-potted into larger pots, or planted permanently in the open air.

Propagation by seeds.

In March 1864 I received 100 seeds of *Chinchona Calisaya*, 75 of which were hermetically sealed, and 25 put up in paper; of those sealed 31 germinated, while of the latter only nine germinated, and are much inferior to the former. Previous to being sown they were steeped in cold water for six hours; they were then taken out of the water and spread on a dry cloth in a warm moist atmosphere for half an hour; the pots for the seed were half filled with potsherds and covered with moss; they were then filled with a compost of two-thirds of fine sifted leaf mould and one-third of sand; the surface being slightly pressed down and made smooth, the seeds were then sown, and merely covered with the soil used; the pots were then plunged in damp sand, on a bottom heat of from 75° to 80° Fahr., and the seed began to germinate on the 20th day after being sown.

In the treatment of seeds it is of great importance to attend to the requisites for germination, which are moisture, heat, light, and air, and these should be carefully supplied.

The soil in which the seeds are sown should always be kept moist until germination takes place; afterwards they should be watered more sparingly.

The seeds should be kept shaded, and air admitted freely. After the seedlings have attained to a height of from three-fourth inch to one inch, they may be potted singly into two-inch pots, in a compost of fine black loam and sand, equal parts of each, and kept in a warm atmosphere, carefully watered, and shaded during sunshine.

As my experience in the cultivation of these valuable plants has only been one year, I will not attempt to say anything about open air cultivation; but I hope, if spared, to give a more detailed account of the propagation and cultivation of the *Chinchona* plant in its different stages of advancement in my next report.

(signed) *John McKay.*

New Quito, Kangra Valley,
1 March 1865.

COPY of a Letter from Secretary to Government, Punjab, to the Commissioner and Superintendent, Jullunder Division; (No. 436 A., dated 28 April 1864.)

WITH reference to your letter, No. 225, dated 31st October last, I am directed to forward, for your information, copies of the correspondence, marginally noted, relative to the application of Captain Nassau Lees, LL.D., for land for the purpose of planting experimentally the Chinchona plant.

From Punjab Government to Captain Lees, No. 1004, dated 7 Nov. 1863.
From Captain Lees, dated 31 Dec. 1863.

The Lieutenant Governor has already told Captain Lees that his Honour considers any charge imputing undue obstruction either to yourself or Mr. Egerton as destitute of foundation, and it will be seen from Dr. Lees' letter, now sent, that he no longer prefers this complaint.

So far back as July last, the Lieutenant Governor informed Dr. Lees that his Honour was prepared, if he still desired it, to grant him 25 acres, at the average price per acre for the auction sales of the year, from the reserved land at Kusmul.

His Honour in so doing was actuated by the consideration that it is of great importance to give free scope to an experiment so valuable, if successful, as that which aims at the naturalization of the Chinchona plant. The objection founded by you on Captain Lees' absenteeism is now obviated by his having a professional English gardener on the spot, and his Honour is inclined to think that the experiment may perhaps be safer in Captain Lees' hands than if under the direct superintendence of Government.

The Lieutenant Governor has now, therefore, decided to grant 100 acres of the reserved land on the terms above stated, and I am to request you will be so good as to see that no delay takes place in marking off and delivering it to Captain Lees' agents.

No. 436 B., dated 28 April 1864.

COPY of the above forwarded for the information of Captain Lees.

By order, &c.,

R. H. Davies,
Secretary to Government, Punjab.

From Captain *W. N. Lees*, LL.D., to Secretary to Government, Punjab;
(dated 10 May 1864.)

I HAVE the honour to acknowledge receipt of copy of a letter from Secretary to Government, Punjab, to the Commissioner and Superintendent, Jullunder Division, No. 436 A., dated 28th April 1864.

The Lieutenant Governor has been pleased to permit me to purchase 100 acres of the land reserved by Government at the auction sale of the 9th June 1863, and I have to solicit that you will do me the favour to tender my acknowledgments to his Honour for this concession.

From Colonel *J. E. Gastrell*, Boundary Commissioner, to Captain *W. N. Lees*;
(dated Surveyor General's Office, 26 April 1865.)

REFERRING to a map of isothermal lines, I find that New Quito is situated at about the same distance north of the isothermal line of greatest heat, or, as some call it, the equator of heat, as Riobamba is to the south. The mean annual temperature of the places may therefore be assumed the same, apart of course, from all considerations of height.

The lofty ranges of mountains overhanging to the north-east of your Chinchona locality, are also very similar in relative position and effect to those dominating Riobamba to the north-west and west; both serve the same purpose for the plains and valleys extended at their feet, over which, in the first case, the south-west wind carries up clouds and vapour to be condensed, and which, falling in copious showers on the mountains, supplies the great affluents of the Indus with water, fertilising the Punjab. So also in South America, the south-east winds sweeping up from the Atlantic across the vast plains watered by the Amazon and its tributaries, carries up the clouds and vapour which subsequently supplies these great rivers with water.

The similarity between these places, notwithstanding differences of latitude, appears striking in these respects.

I hope you may be able to continue your observations at New Quito, and if you could add barometrical observations to them, they would be very valuable in helping to unravel the mysterious laws that govern our Indian atmosphere. When, hereafter, Government sanction a staff of meteorological observers in India, the whole might be reduced at the head quarter office, leaving mere recording to be done at your Chinchona plantation.

MONTHLY REPORT on the Number, Condition, and Distribution of Chinchona Plants at
New Quito on the 30th April 1865.

Number.	Names.	Number on 31st March.	Number Propagated since.	Casualties.	Number on 30th April.	REMARKS.
1	C. succirubra -	2,798	290	5	3,078	All the plants and cuttings are in a most healthy condition. The number of plants imported in March 1864 was 218, of which eight were planted out, leaving 205 as a propagating stock.
2	C. Calisaya -	118	20	-	138	
3	C. Condaminea -	1,262	150	-	1,412	
4	C. micrantha -	75	5	2	78	
5	C. Peruviana -	49	-	-	49	
	TOTAL - -	4,297	465	7	4,755	

The number of plants in nursery beds is 500; they have commenced to grow, and will produce a number of cuttings this month.

The number of plants planted out permanently, is—

C. succirubra	-	-	-	-	-	-	80
C. Condaminea	-	-	-	-	-	-	11
C. micrantha	-	-	-	-	-	-	4
C. Calisaya	-	-	-	-	-	-	1=96

The average height of these plants, when planted out on the 15th of last month, was 7½ inches; and they are now, without exception, healthy and vigorous young plants.

METEOROLOGICAL OBSERVATIONS taken at New Quito Chinchona Plantation, Kangra Valley, for September 1864.
 Latitude, 32° 7' 8" N.; Longitude, 76° 28' 35" E. Height above the Sea, 4,500 feet.

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Day of the Month.	Maximum in Air.	Minimum in Air.	Mean in Air.	Maximum in Sun's Rays.	OBSERVATIONS TAKEN AT 9.30 A.M.								OBSERVATIONS TAKEN AT 3.30 P.M.						REMARKS.	
					Wet Bulb Thermometer.	Dry Bulb Thermometer.	Dew Point Computed.	Elastic Force of Vapour.	Humidity.	Wind.	Cloud.	Rain.	Wet Bulb Thermometer.	Dry Bulb Thermometer.	Dew Point Computed.	Elastic Force of Vapour.	Humidity.	Wind.		Cloud.
1	80.5	59.2	69.8	90.0	70.2	73.8	67.7	.678	.813	S.	10	.3	71.0	77.0	66.6	.657	.709	W.	2	Dense fog till 11 a.m., then cleared, and fair all day.
2	78.2	70.0	74.1	82.0	68.0	70.2	66.2	.644	.878	S.	8	.225	68.2	71.0	60.0	.639	.843	W.	10	Ag. morn. cum. Showery in afternoon.
3	80.0	62.5	71.2	83.0	67.0	68.8	65.6	.630	.895	W.	10	.0	70.0	73.0	67.6	.675	.832	S.	10	Ag. morn. overcast. Showery in afternoon.
4	78.5	60.8	68.6	78.5	67.0	69.5	65.0	.617	.856	S.E.	8	1.82	74.0	77.2	71.8	.779	.835	S.W.	2	Heavy rain from 2 to 4 a.m.; afternoon very warm.
5	86.3	84.2	75.2	97.8	69.0	73.0	65.8	.635	.783	S.W.	5	.350	71.0	77.8	66.2	.644	.676	W.	8	Ag. morn.; afternoon cloudy; cum.
6	86.2	60.8	74.5	92.5	66.8	67.2	66.5	.650	.697	W.	10	.091	72.5	79.8	67.4	.670	.660	W.	5	Showery in morn. Thundering in afternoon.
7	87.2	68.5	77.8	92.5	75.0	77.8	73.0	.811	.852	W.	5	.175	70.2	75.8	66.3	.646	.725	W.	8	Ag. morn. heavy dew stratus. Showery in afternoon.
8	82.2	65.0	73.6	91.8	67.5	69.2	66.1	.641	.899	E.	2	.1	70.5	72.5	68.9	.706	.885	S.W.	10	Del. morn. heavy dew stratus. Afternoon rainy.
9	80.2	65.0	72.6	89.0	68.0	69.8	66.6	.658	.897	W.	5	.175	70.2	74.2	67.4	.671	.794	W.	2	Dist. thr. and a few drops rain in morn. Ag. afternoon.
10	83.2	58.0	70.6	92.0	70.2	75.5	66.8	.650	.737	W.	0	.0	71.5	83.5	63.1	.578	.804	S.W.	2	Del. morn. heavy dew stratus. Del. afternoon.
11	84.2	58.0	71.1	96.5	68.2	80.0	59.9	.518	.504	S.E.	0	.0	71.2	84.8	61.7	.550	.460	N.W.	2	Ag. morn. heavy dew. Sun's rays very hot.
12	88.0	59.8	68.4	98.0	71.0	80.0	64.7	.611	.697	N.	0	.0	74.0	85.5	65.9	.637	.521	N.	2	Cum. del. morn. Sun very hot all day.
13	86.5	59.8	73.1	96.8	73.0	77.0	70.2	.738	.796	N.	0	.0	73.5	85.0	65.4	.626	.520	S.	2	Morn. sun very hot. Del. afternoon.
14	87.0	64.5	75.5	99.8	68.2	69.8	66.9	.659	.905	N.	2	.0	70.0	70.0	70.0	.783	1.000	N.	10	Ag. morn. stratus. Thunder and rain in afternoon.
15	83.5	60.5	72.0	99.2	70.0	74.0	67.2	.666	.794	N.	2	.480	74.0	77.8	71.3	.766	.808	N.	2	Snow on high ranges. Afternoon sun very hot.
16	82.5	62.0	72.2	89.8	64.3	67.5	61.7	.550	.817	N.W.	2	.0	70.5	76.8	66.1	.641	.696	W.	10	Del. morn. stratus. Thunder in afternoon.
17	80.5	60.2	70.3	90.2	67.5	75.8	61.7	.550	.617	S.W.	5	.0	69.0	75.0	64.8	.613	.706	S.W.	8	Del. morn. heavy dew. Most ag. afternoon.
18	81.5	65.0	73.2	90.0	70.5	76.8	66.1	.641	.696	N.E.	2	.0	71.0	83.8	62.0	.556	.480	N.E.	2	Ag. morn. cum. Again afternoon cum.
19	82.0	60.0	71.0	91.2	68.0	76.0	62.4	.564	.829	W.	5	.0	76.0	80.8	72.6	.800	.762	W.	2	Del. morning, heavy dew. Sun very powerful.
20	82.2	64.5	73.3	94.5	65.5	69.5	62.8	.562	.780	N.	2	.0	75.0	82.5	69.7	.726	.654	N.	2	Ag. morn. stratus. Sun very hot all day.
21	83.1	59.2	71.1	95.8	62.5	69.2	57.1	.467	.655	N.	0	.0	67.0	82.0	56.5	.457	.418	N.W.	2	Morn. sun very hot. Cum. Del. afternoon.
22	82.0	59.2	70.6	96.2	60.0	64.8	56.2	.452	.787	N.	0	.0	70.2	81.4	62.4	.564	.527	N.	0	Morning very cold. Sun very hot all day.
23	81.8	53.8	67.8	97.2	61.8	67.3	57.4	.472	.707	N.	0	.0	71.2	77.8	66.6	.653	.685	N.	0	Most ag. morn. Afternoon sun very hot.
24	84.2	54.8	69.5	97.8	61.8	66.2	57.4	.472	.733	N.	0	.0	65.8	72.0	60.8	.538	.680	S.	0	Del. morn. Sun's rays very powerful all day.
25	89.0	57.5	73.2	100.0	60.8	69.8	58.6	.412	.566	S.	0	.0	64.5	80.5	53.3	.407	.391	S.	0	Ag. morn. Sun's rays very powerful.
26	87.2	52.5	69.8	102.4	59.2	70.3	50.3	.364	.491	N.	0	.0	65.5	82.0	53.9	.416	.381	N.	0	Morning very cold. Del. afternoon.
27	89.2	54.5	71.8	100.8	57.2	80.2	41.1	.258	.251	N.	0	.0	67.2	79.5	58.6	.493	.490	N.	0	Morning sun very hot. Ag. afternoon.
28	90.2	53.8	72.0	105.5	60.8	80.0	47.4	.328	.321	N.	0	.0	64.8	80.5	53.8	.415	.399	N.	0	Very cold morn. Sun's rays very hot all day.
29	94.2	57.8	76.0	100.8	67.8	79.8	59.4	.507	.499	N.	0	.0	66.8	82.2	56.0	.449	.409	N.	0	Ag. morn. Del. afternoon.
30	90.8	52.8	71.8	99.8	60.2	76.8	48.6	.348	.372	N.	0	.0	69.0	84.8	57.9	.481	.403	N.	0	Cold morn. Very warm afternoon.
Sums -	2534.1	1804.2	2151.7	2761.4	1986.5	2185.6	-	-	-	-	88	3.716	2105.3	2366.5	-	-	-	-	100	
Means -	84.4	60.1	71.7	92.1	66.2	72.9	60.8	.533	.659	-	2	.123	70.2	78.9	64.1	.598	.606	-	3	

OF THE CHINCHONA PLANT INTO INDIA.

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METEOROLOGICAL OBSERVATIONS taken at New Quito Chinchona Plantation, Kangra Valley, for the Month of October 1864.
 Latitude, 32° 7' 8" N.; Longitude, 76° 28' 35" E. Height above the Sea, 4,500 feet.

Day of the Month.	Maximum in Air.	Minimum in Air.	Mean in Air.	Maximum in Sun's Rays.	OBSERVATIONS TAKEN AT 9.30 A.M.								OBSERVATIONS TAKEN AT 8.30 P.M.							REMARKS.
					Wet Bulb Thermometer.	Dry Bulb Thermometer.	Dew Point Computed.	Elastic Force of Vapour.	Humidity.	Cloud.	Wind.	Rain.	Wet Bulb Thermometer.	Dry Bulb Thermometer.	Dew Point Computed.	Elastic Force of Vapour.	Humidity.	Cloud.	Wind.	
1	84.5	54.8	69.6	98.2	58.2	70.0	48.8	.345	.471	0	N.	0	70.2	75.8	66.8	.646	.725	0	N.	Del. morn. Beautiful afternoon.
2	80.8	52.2	66.5	90.2	57.8	69.2	48.7	.344	.482	0	N.	0	68.0	80.5	59.2	.504	.485	0	N.	Ag. morn. heavy dew. Del. afternoon.
3	87.2	53.0	70.5	99.8	60.0	69.8	52.2	.391	.537	0	N.	0	62.2	81.0	49.0	.348	.329	2	N.E.	Del. morn. heavy dew. Ag. afternoon cum.
4	85.5	50.2	67.8	99.2	60.8	71.5	52.2	.391	.507	0	S.	0	68.5	70.8	66.7	.655	.870	2	N.	Del. morn. heavy dew. Afternoon squally.
5	88.5	51.2	69.8	90.4	57.8	68.4	49.3	.352	.507	0	-	0	68.5	75.8	63.4	.584	.655	2	N.	Ag. morn. Del. afternoon cum.
6	85.5	57.8	71.0	90.8	60.5	66.8	55.5	.441	.670	0	N.	0	67.8	75.5	62.4	.584	.639	2	N.	Ag. morn. Del. afternoon cum.
7	84.8	50.8	67.8	90.5	67.2	69.0	65.8	.635	.896	0	N.	0	69.8	74.2	66.7	.655	.775	2	N.	Del. morn. heavy dew. Ag. afternoon cum.
8	84.5	48.8	66.6	97.8	59.8	64.2	55.8	.446	.743	0	N.	0	64.8	69.8	60.8	.533	.732	2	N.	Very cold morn. Beautiful afternoon cum.
9	89.5	50.2	69.8	99.8	48.8	59.8	38.9	.287	.461	0	N.	0	67.2	70.8	64.3	.603	.801	5	N.	Del. morn. Beautiful afternoon cum.
10	79.8	45.8	62.8	90.2	49.8	58.8	41.7	.264	.582	0	N.	0	65.8	74.8	59.5	.509	.590	2	N.	Del. morn. Del. afternoon stratus.
11	84.8	50.5	67.6	97.8	57.8	64.5	52.4	.388	.639	0	N.	0	64.8	74.8	57.8	.479	.556	5	N.	Ag. morn. Beautiful afternoon stratus.
12	87.8	50.2	68.0	99.8	54.2	60.0	49.0	.348	.672	0	N.	0	64.8	72.0	59.0	.500	.688	2	N.	Ag. morn. Del. afternoon cum.
13	87.8	49.8	68.8	100.0	52.5	56.8	46.8	.320	.645	0	N.	0	69.8	74.2	66.7	.655	.775	2	N.	Cold morn. heavy dew. Ag. afternoon cum.
14	79.8	47.4	63.6	90.8	50.6	57.2	44.7	.296	.631	0	N.	0	64.8	77.2	56.1	.461	.483	5	N.	Del. morn. Beautiful afternoon cum.
15	87.8	43.8	65.8	89.8	49.5	52.8	46.2	.313	.782	0	N.	0	68.2	72.4	64.8	.613	.771	8	N.	Very cold morn. Thunder in afternoon.
16	80.8	47.8	64.3	88.8	49.8	57.2	43.1	.270	.595	0	N.	0	60.2	70.0	52.4	.394	.544	8	N.	Cold morn. heavy dew. Thunder; a few drops rain.
17	82.2	43.0	62.6	90.0	47.2	50.0	44.1	.289	.801	0	N.	0	60.0	65.8	55.4	.439	.691	5	N.	Very cold morn. Beautiful afternoon.
18	82.8	47.4	65.1	86.8	49.8	54.5	45.1	.301	.708	0	N.	0	60.2	65.0	56.4	.456	.739	8	N.	Beautiful morn. Thunder and one shower of rain.
19	80.5	50.0	65.2	84.8	54.5	64.5	46.5	.317	.522	2	N.	0	64.0	75.8	55.7	.444	.498	2	S.	Del. morn. cum.; one shower rain at 12 p.m.
20	80.8	50.0	65.4	84.8	47.0	52.2	41.8	.265	.678	0	N.	0.275	61.2	77.8	49.6	.356	.374	0	S.	Del. morn. Squally in afternoon.
21	88.8	48.8	68.8	99.0	52.5	56.5	48.9	.346	.757	0	N.	0	60.5	70.2	52.7	.398	.539	0	N.	Del. morn. Del. afternoon.
22	80.2	48.8	64.5	88.8	50.2	59.2	42.1	.268	.582	0	N.	0	61.2	70.2	54.0	.418	.566	2	N.	Ag. morn. Beautiful afternoon.
23	84.5	47.2	65.8	90.8	49.8	60.5	40.2	.249	.472	0	N.	0	64.8	72.8	58.4	.489	.607	0	N.	Del. morn. Del. afternoon.
24	80.7	45.8	63.2	97.2	49.5	60.0	40.0	.248	.479	0	N.	0	60.0	64.0	56.4	.456	.765	0	N.	Ag. morn. Beautiful afternoon.
25	84.8	50.2	67.5	90.2	54.0	64.2	44.8	.397	.495	0	S.	0	50.2	60.0	41.4	.281	.504	0	N.	Ag. morn. heavy dew. Del. afternoon.
26	82.8	48.8	65.8	90.0	50.0	58.8	42.1	.268	.540	0	S.	0	62.2	65.8	59.3	.505	.795	0	N.	Del. morn. Beautiful afternoon.
27	84.2	48.5	66.3	89.2	52.2	60.0	45.2	.302	.586	0	N.	0	55.5	60.2	51.3	.378	.724	0	N.	Ag. morn. Del. afternoon.
28	80.8	45.2	63.0	90.2	49.2	55.5	42.9	.277	.628	0	N.	0	55.5	59.8	51.6	.393	.745	0	N.	Ag. morn. heavy dew. Ag. afternoon.
29	85.8	49.8	67.8	89.8	52.2	60.2	45.0	.299	.573	0	N.E.	0	60.5	67.8	54.7	.428	.629	0	N.	Del. morn. Beautiful afternoon.
30	89.5	47.8	68.6	99.8	49.8	55.5	44.1	.289	.655	0	N.	0	60.2	66.8	54.9	.432	.655	0	N.	Ag. morn. Del. afternoon.
31	80.5	50.2	65.3	88.5	55.2	60.5	50.4	.366	.694	2	N.	0	60.2	68.5	53.6	.412	.591	5	N.	Ag. morn. cum. Beautiful afternoon cum.
Sum	2608.3	1525.8	2065.8	2773.8	1658.2	1890.1	-	-	-	4	-	0.275	1961.6	2200.1	-	-	-	71	-	
Means	84.1	49.2	66.6	89.4	53.5	61.0	46.7	.319	.594	-	-	.008	63.3	71.0	57.1	.467	.616	2	-	

METEOROLOGICAL OBSERVATIONS taken at New Quito Chinchona Plantation, Kangra Valley, for November 1864.
 Latitude, 32° 7' 8" N.; Longitude, 76° 28' 35" E. Height above the Sea, 4,500 feet.

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Day of the Month.	Maximum in Air.	Minimum in Air.	Mean in Air.	Maximum in Sun's Rays.	OBSERVATIONS TAKEN AT 9.30 A.M.								OBSERVATIONS TAKEN AT 3.30 P.M.							REMARKS.	
					Wet Bulb Thermometer.	Dry Bulb Thermometer.	Dew Point Computed.	Elastic Force of Vapour.	Humidity.	Cloud.	Wind.	Rain.	Wet Bulb Thermometer.	Dry Bulb Thermometer.	Dew Point Computed.	Elastic Force of Vapour.	Humidity.	Wind.	Cloud.		
1	79.2	47.8	63.5	89.5	49.8	54.2	45.4	.304	.722	0	N.	0	60.8	75.2	50.7	.370	.424	N.	0	Ag. morn. heavy dew. Del. afternoon.	
2	78.8	49.5	64.1	88.5	50.2	54.5	45.9	.310	.729	0	N.	0	55.8	70.8	43.8	.286	.380	N.	0	Fresh morn. heavy dew. Ag. afternoon.	
3	88.5	48.0	68.7	94.5	50.0	54.2	45.8	.309	.734	0	N.	0	60.5	77.8	48.4	.340	.357	N.	0	Ag. morn. heavy dew. Del. afternoon.	
4	80.0	45.5	62.7	89.2	47.2	50.4	43.7	.285	.779	0	N.	0	62.5	77.8	51.8	.386	.405	N.	2	Cold morn. heavy dew. Ag. afternoon stratus.	
5	79.5	47.8	63.5	88.5	48.8	54.5	45.1	.301	.708	0	S.	0	59.8	67.8	53.4	.409	.602	N.	0	Beautiful morn. Afternoon very cold.	
6	88.4	44.5	66.4	89.8	47.2	50.2	43.9	.287	.768	0	N.	0	60.2	68.8	53.3	.407	.578	N. E.	2	Cold morn. heavy dew. Ag. afternoon cum.	
7	80.2	45.2	62.7	87.0	48.2	54.5	41.9	.286	.626	0	N.	0	60.8	72.5	51.4	.380	.476	N.	2	Ag. morn. Del. afternoon cum.	
8	80.2	47.0	63.6	85.2	50.0	54.2	45.8	.309	.734	0	N.	0	62.5	66.2	59.5	.509	.790	N.	2	Del. morn. Beautiful afternoon cum.	
9	80.0	46.2	63.0	84.0	48.8	52.2	45.4	.304	.777	0	N.	0	55.5	65.8	47.3	.326	.513	N.	5	Ag. morn. heavy dew. Del. afternoon cum.	
10	77.5	47.2	62.3	88.0	49.5	54.0	45.0	.299	.715	0	N.	0	60.0	70.2	51.8	.386	.523	N.	2	Del. morn. Afternoon squally.	
11	78.2	48.0	63.1	81.5	50.0	54.2	45.8	.309	.734	0	N.	0	58.2	66.8	51.3	.378	.575	N.	5	Ag. morn. heavy dew. Beautiful afternoon cum.	
12	79.2	48.2	63.7	84.0	50.2	57.5	43.6	.284	.599	0	N.	0	58.8	66.8	52.4	.394	.600	N.	2	Ag. morn. afternoon squally.	
13	77.8	45.2	61.5	82.5	47.5	50.2	44.5	.294	.808	0	S.	0	64.5	77.2	55.6	.443	.475	N.	2	Cold morn. Del. afternoon stratus.	
14	79.5	45.0	62.2	82.2	48.2	52.2	44.2	.291	.744	0	N.	0	62.2	75.5	52.9	.401	.455	N.	8	Cold morn. heavy dew. Mild afternoon cum.	
15	79.2	45.5	62.3	84.0	48.5	52.0	45.0	.299	.771	0	N.	0	58.2	67.8	50.5	.368	.541	N.	5	Ag. morn. Afternoon very threatening.	
16	77.2	46.0	61.6	82.0	48.2	52.0	44.4	.293	.755	0	N.	0	60.2	64.0	56.8	.462	.775	N.	10	Cold morn. Thunder all night, one shower rain.	
17	75.8	44.2	60.0	79.8	46.2	48.0	44.2	.291	.868	5	N.	0	57.0	64.2	50.5	.368	.613	N.	5	Thunder, a few drops rain. Del. afternoon cum.	
18	70.2	41.0	56.6	77.2	46.2	50.0	42.0	.267	.740	0	N.	0	67.0	71.2	63.6	.588	.770	N.	2	Very cold morn. Ag. afternoon stratus.	
19	74.2	39.5	56.8	78.5	41.8	50.0	32.8	.187	.518	0	N.	0	60.2	75.0	49.8	.358	.413	N.	2	Very cold morn. Del. afternoon cum.	
20	78.5	40.8	59.6	87.2	44.2	48.8	39.1	.239	.693	0	N.	0	58.2	66.8	51.3	.378	.575	N.	2	Ag. morn. Del. afternoon cum.	
21	77.8	40.0	58.9	88.5	43.5	50.2	36.1	.213	.585	0	N.	0	51.2	61.0	42.4	.271	.505	N.	0	Cold morn. heavy dew. Del. afternoon.	
22	78.0	39.5	58.7	88.2	42.0	60.0	25.8	.135	.261	0	N.	0	50.5	65.0	38.9	.237	.384	N.	0	Sharp morn. Cold afternoon.	
23	80.0	38.2	58.2	87.0	40.0	46.2	33.2	.200	.639	0	N.	0	51.5	65.5	40.3	.250	.398	N.	0	Very cold morn. Del. afternoon.	
24	77.5	38.2	57.8	85.2	46.0	54.0	38.0	.229	.548	0	N.	0	51.5	65.2	40.5	.252	.405	N.	0	Very sharp morn. Beautiful afternoon.	
25	74.5	39.5	57.0	80.0	49.0	61.0	38.2	.231	.430	0	N.	0	50.2	66.2	37.4	.224	.348	N.	0	Cold morn. heavy dew. Del. afternoon.	
26	70.2	39.8	55.0	84.2	44.5	47.5	41.2	.259	.787	0	N.	0	60.0	64.2	56.2	.452	.753	N.	5	Ag. morn. Beautiful afternoon cum.	
27	75.2	40.2	57.7	79.5	47.6	54.8	40.8	.255	.593	0	S.	0	60.2	66.8	54.9	.432	.658	N.	6	Ag. morn. Del. afternoon cum.	
28	70.0	40.2	55.1	78.5	44.2	60.0	30.0	.165	.319	0	S.	0	60.8	65.5	57.0	.466	.742	N.	8	Ag. morn. Del. afternoon cum.	
29	77.2	39.5	58.3	84.2	42.8	55.0	30.6	.189	.390	0	S.	0	55.5	67.8	45.7	.307	.451	W.	10	Cold morn. heavy dew. Ag. afternoon cum.	
30	70.8	40.5	55.6	77.0	47.8	54.2	41.4	.261	.820	0	N.	0	60.5	70.8	52.3	.393	.523	W.	0	Ag. morn. Beautiful afternoon.	
Sums	2333.3	1807.7	1820.2	2535.4	1409.3	1690.7	-	-	-	5	-	0	1754.8	2066.2	-	-	-	-	-	89	
Means	77.7	43.5	60.6	84.5	47.0	53.0	41.0	.267	.638	-	-	0	58.5	68.9	50.2	.364	.516	-	-	3	

OF THE CHINCHONA PLANT INTO INDIA.

363.

METEOROLOGICAL OBSERVATIONS taken at New Quito Chinchona Plantation, Kangra Valley, for December 1864.
 Latitude, 32° 7' 8" N.; Longitude, 76° 28' 35" E. Height above the Sea, 4,500 feet.

Day of the Month.	Maximum in Air.	Minimum in Air.	Mean in Air.	Maximum in Sun's Rays.	OBSERVATIONS TAKEN AT 9.30 A.M.								OBSERVATIONS TAKEN AT 3.30 P.M.						REMARKS.	
					Wet Bulb Thermometer.	Dry Bulb Thermometer.	Dew Point Computed.	Elastic Force of Vapour.	Humidity.	Rain.	Cloud.	Wind.	Wet Bulb Thermometer.	Dry Bulb Thermometer.	Dew Point Computed.	Elastic Force of Vapour.	Humidity.	Cloud.		Wind.
1	74.2	38.2	56.2	79.5	40.2	45.8	34.0	.196	.634	0	0	N.	56.2	65.8	52.1	.390	.614	2	N.	Ag. morn. Beautiful afternoon.
2	74.2	36.0	55.1	80.5	39.5	44.2	3.9	.195	.670	0	0	N.	50.0	54.2	45.8	.309	.734	0	N.	Ag. morn. dew. Cold afternoon.
3	78.0	32.0	55.0	80.8	36.5	40.0	31.9	.180	.726	0	0	N.	54.8	64.2	46.3	.314	.528	2	N.	Sharp morn. Beautiful afternoon.
4	Broken.	-	-	-	37.5	44.2	29.5	.161	.553	0	0	S.	50.0	64.8	38.2	.231	.377	5	N.	Ag. morn. dew. Del. afternoon.
5	-	-	-	-	40.2	44.0	35.6	.209	.726	0	5	W.	50.2	54.2	46.2	.313	.743	5	W.	Pleasant morn. Afternoon threatening.
6	-	-	-	-	40.2	45.5	34.4	.199	.052	0	10	W.	50.0	54.0	46.0	.311	.744	10	W.	Ag. morn. cum. Very strong wind afternoon.
7	-	-	-	-	40.0	41.0	38.7	.235	.914	.075	10	N.	45.0	45.0	45.0	.299	1.000	10	N.	Very disagreeable morn. Driz. rain all day.
8	-	-	-	-	45.8	47.5	43.9	.287	.872	.4	10	N.	54.2	54.8	58.6	.412	.958	10	N.	Rain in morn. Raining all day.
9	-	-	-	-	45.8	54.2	37.4	.224	.532	.3	10	N.	54.2	58.2	50.6	.369	.759	10	N.	Mild morn. Strong wind in afternoon.
10	-	-	-	-	45.8	49.5	41.7	.264	.746	0	10	N.	50.5	63.2	39.1	.289	.412	10	N.	Del. morn. Strong cold wind in afternoon.
11	-	-	-	-	47.2	49.8	44.3	.292	.816	0	10	N.	50.5	55.2	45.8	.309	.709	10	N.	Strong cold wind all day.
12	-	-	-	-	47.2	47.2	47.2	.325	1.000	.025	10	N.	56.8	60.2	53.7	.418	.791	10	N.	Ag. morn. Del. afternoon mild.
13	-	-	-	-	48.2	49.8	46.4	.316	.888	.150	10	N.	50.2	54.0	46.4	.316	.706	10	N.	Mild morn. Ag. afternoon.
14	-	-	-	-	47.8	49.2	46.3	.314	.897	.2	10	N.	50.0	52.2	47.8	.338	.852	10	N.	Thunder, rain, and hail all day.
15	-	-	-	-	40.2	44.8	34.7	.202	.660	.225	10	N.	48.8	50.5	47.1	.324	.880	10	N.	Driz. rain in morn. Ag. afternoon.
16	-	-	-	-	38.8	40.2	37.0	.220	.884	0	10	N.	48.2	48.8	47.5	.329	.954	10	N.	Cold morn. Raining in afternoon.
17	-	-	-	-	48.5	51.0	46.0	.311	.832	.325	10	E.	50.2	51.2	49.2	.350	.928	10	N. E.	Gold morn. Heavy rain in afternoon.
18	-	-	-	-	47.8	49.2	46.3	.314	.897	1.108	10	S. W.	51.2	54.8	47.6	.330	.767	10	W.	Heavy rain in morn. Thunder all day.
19	-	-	-	-	40.2	47.8	31.8	.179	.538	.4	0	N.	48.5	54.2	42.8	.276	.656	0	S.	Ag. morn. Beautiful afternoon.
20	-	-	-	-	40.0	49.8	29.2	.159	.444	0	0	N.	51.5	61.0	42.9	.277	.516	0	N.	Very cold morn. Del. afternoon.
21	-	-	-	-	47.8	54.0	41.6	.263	.629	0	0	N.	54.8	60.1	50.0	.361	.694	0	N.	Del. morn. dew. Beautiful afternoon.
22	-	-	-	-	42.5	50.0	34.2	.198	.548	0	0	N.	54.2	62.8	46.5	.317	.554	0	N.	Ag. morn. frost. Beautiful afternoon.
23	-	-	-	-	38.2	50.0	25.2	.131	.368	0	0	N.	58.0	62.5	58.9	.416	.735	0	-	Ag. morn. frost. Del. afternoon.
24	-	-	-	-	40.2	47.8	31.8	.179	.538	0	0	N.	50.2	54.8	45.6	.306	.712	0	N.	Ag. morn. dew. Beautiful afternoon.
25	-	-	-	-	38.2	45.5	30.2	.163	.544	0	0	N.	54.2	61.0	48.1	.336	.626	0	N.	Ag. morn. frost. Del. afternoon.
26	-	-	-	-	38.2	45.0	30.0	.165	.552	0	0	N.	40.2	48.8	30.7	.170	.493	0	N.	Very sharp morn. frost. Del. afternoon.
27	-	-	-	-	40.2	48.8	30.7	.170	.493	0	0	N.	55.0	64.2	46.7	.319	.531	0	N.	Del. morn. dew. Beautiful afternoon.
28	-	-	-	-	38.2	40.8	34.8	.202	.792	0	0	N.	54.2	60.1	48.9	.346	.665	2	N.	Cold morn. frost. Del. afternoon.
29	-	-	-	-	38.8	47.2	29.6	.162	.498	0	2	N.	50.2	58.8	42.5	.272	.548	0	N.	Ag. morn. Beautiful afternoon.
30	-	-	-	-	40.2	47.8	31.8	.179	.538	0	2	N.	50.2	64.0	37.8	.227	.391	0	N.	Del. morn. Ag. afternoon.
31	-	-	-	-	40.2	48.8	30.7	.170	.493	0	0	N.	54.2	64.0	45.4	.304	.510	0	N.	Ag. morn. Beautiful afternoon.
Sums	226.4	106.2	166.3	240.8	1300.1	1460.4	-	-	-	3.208	139	-	1598.4	1781.6	-	-	-	146	-	
Means	75.3	35.4	55.4	80.2	41.9	47.1	36.2	.214	.660	.103	4	-	51.6	57.5	46.3	.314	.662	4	-	

Quito Chinchona Plantation, 1 January 1865.

METEOROLOGICAL OBSERVATIONS taken at New Quito Chinchona Plantation, Kangra Valley, for January 1865.
 Latitude, 32° 7' 8" N.; Longitude, 76° 28' 35" E. Height above the Sea, 4,500 feet.

353.

3 A 4

Day of the Month.	OBSERVATIONS TAKEN AT 9.30 A.M.								OBSERVATIONS TAKEN AT 3.30 P.M.								REMARKS.
	Wet Bulb Thermometer.	Dry Bulb Thermometer.	Dew Point Computed.	Elastic Force of Vapour.	Humidity.	Cloud.	Wind.	Rain.	Wet Bulb Thermometer.	Dry Bulb Thermometer.	Dew Point Computed.	Elastic Force of Vapour.	Humidity.	Cloud.	Wind.		
1	49.0	47.8	31.4	.176	.529	0	N.	0	50.2	57.8	43.4	.282	.589	5	N.	Ag. morn. Afternoon cold and squally.	
2	39.0	44.5	30.2	.166	.565	0	N.	0	50.8	61.0	41.6	.263	.490	0	N.	Cold morn. frost. Del. afternoon.	
3	37.5	48.5	25.4	.132	.387	0	N.	0	54.2	61.2	47.9	.334	.617	0	N.	Ag. morn. Del. afternoon, very warm.	
4	38.5	45.8	30.5	.169	.547	0	N.	0	54.8	61.2	49.0	.346	.643	2	N. W.	Beautiful morn. Afternoon pleasant.	
5	41.8	50.0	32.8	.187	.518	0	N.	0	50.2	58.0	48.2	.280	.591	5	S.	Ag. morn. heavy dew. Beautiful afternoon.	
6	39.8	44.8	28.8	.194	.653	0	N.	0	49.8	51.8	47.8	.333	.863	8	S.	Pleasant morn. Beautiful afternoon.	
7	50.0	54.2	45.8	.309	.734	10	S.	0	50.0	52.2	47.8	.333	.852	10	N.	Mild morn. Cold afternoon, heavy rain.	
8	38.8	45.8	31.1	.174	.563	0	N.	4	48.8	52.5	45.1	.301	.762	8	N.	Ag. morn. Del. afternoon.	
9	38.5	44.2	31.7	.179	.615	0	N.	0	50.0	61.5	39.6	.244	.447	2	N.	Del. morn. heavy dew. Beautiful afternoon.	
10	37.8	48.5	26.0	.136	.399	0	N.	0	49.8	58.5	42.0	.267	.544	0	N.	Very sharp morn. Beautiful afternoon.	
11	39.8	44.8	33.8	.194	.653	2	N.	0	48.8	59.5	39.2	.240	.472	5	S.	Beautiful morn. Del. afternoon.	
12	40.8	59.2	24.2	.125	.248	2	S.	0	58.0	61.2	55.1	.435	.604	8	S.	Mild morn. Pleasant afternoon.	
13	39.8	45.0	33.6	.198	.645	0	N.	0	50.8	64.2	38.7	.235	.392	8	N. E.	Ag. morn. Del. afternoon.	
14	39.8	49.8	28.8	.156	.486	10	S.	0	52.0	59.2	45.5	.305	.605	8	S.	Mild morn. Beautiful afternoon.	
15	50.0	61.2	39.9	.247	.457	2	S.	0	60.2	64.8	56.5	.457	.746	8	S.	Beautiful mild morn. Del. afternoon.	
16	53.0	59.2	47.4	.328	.651	5	S.	0	60.0	64.8	56.2	.452	.737	5	S.	Mild morn. Beautiful afternoon.	
17	52.2	60.0	45.2	.302	.583	5	N.	0	44.2	59.0	30.9	.172	.344	5	S.	Del. morn. Cold afternoon, squally.	
18	54.0	60.2	48.4	.340	.651	2	S.	0	60.0	65.8	55.4	.439	.691	5	N. W.	Del. morn. Beautiful afternoon.	
19	49.8	58.2	42.2	.269	.554	10	W.	0	58.5	64.8	53.5	.410	.669	8	S.	Ag. morn. dew. Del. afternoon.	
20	44.2	50.2	37.6	.226	.621	2	S.	0	59.8	64.2	55.8	.446	.743	8	S.	Ag. morn. dew. Beautiful afternoon.	
21	48.5	54.0	48.0	.278	.666	5	S.	0	64.2	64.5	64.0	.596	.932	10	S.	Very mild morn. Del. afternoon, rainy.	
22	47.8	50.2	45.2	.302	.630	5	W.	.075	62.5	64.8	60.7	.531	.866	5	S.	Ag. morn. dew. Pleasant afternoon.	
23	47.8	60.0	36.8	.219	.423	0	N.	0	55.5	64.5	48.3	.339	.558	2	S.	Pleasant morn. Beautiful afternoon.	
24	55.2	62.5	48.6	.348	.606	2	S.	0	57.2	64.5	51.4	.380	.626	5	W.	Del. morn. Pleasant afternoon.	
25	50.2	60.2	41.2	.259	.496	8	S.	0	58.5	65.0	49.7	.357	.579	5	S. W.	Beautiful morn. dew. Del. afternoon.	
26	51.0	57.5	45.2	.301	.635	0	S.	0	55.0	65.0	47.0	.328	.524	0	W.	Del. morn. Sun very hot in afternoon.	
27	51.0	57.0	45.6	.306	.657	0	N.	0	55.5	63.5	48.3	.339	.578	2	S.	Ag. morn. dew. Beautiful afternoon.	
28	56.0	64.2	48.6	.343	.572	0	S.	0	60.2	65.8	55.7	.444	.699	2	S.	Del. morn. Pleasant afternoon.	
29	49.0	52.5	45.5	.305	.772	10	S.	0	60.0	65.8	55.4	.439	.691	8	S. W.	Threatening morn. Afternoon squally.	
30	44.0	44.2	43.8	.286	.988	10	S. W.	.1	46.2	46.8	45.5	.305	.953	10	S. W.	Disagreeable morn. ; heavy rain all day.	
31	41.0	41.0	41.0	.257	1.000	10	S. W.	2.625	44.2	44.2	44.2	.291	1.000	10	S. W.	Disagreeable morn. ; heavy rain and hail all day.	
Sums - -	1405.6	1525.2	-	-	-	100	-	3.200	1677.9	1877.6	-	-	-	167	-		
Means - -	45.3	49.2	41.0	.257	.734	-	-	-	54.1	60.6	48.2	.338	.639	-	-		

OF THE CHINCHONA PLANT INTO INDIA.

METEOROLOGICAL OBSERVATIONS taken at New Quito Chinchona Plantation, Kangra Valley, for February 1865.

Latitude, 32° 7' 8" N.; Longitude, 76° 28' 35" E. Height above the Sea, 4,500 feet.

Day of the Month.	OBSERVATIONS TAKEN AT 9.30 A.M.								OBSERVATIONS TAKEN AT 3.30 P.M.							REMARKS.
	Wet Bulb Thermometer.	Dry Bulb Thermometer.	Dew Point Computed.	Elastic Force of Vapour.	Humidity.	Cloud.	Wind.	Rain.	Wet Bulb Thermometer.	Dry Bulb Thermometer.	Dew Point Computed.	Elastic Force of Vapour.	Humidity.	Cloud.	Wind.	
	°	°	°	Inches.					°	°	°	Inches.				
1	41.2	51.2	31.2	.174	.462	5	S.	1.150	39.8	40.5	38.9	.237	.940	8	S.E.	Beautiful morn. Terrific thunderstorm in afternoon.
2	40.0	44.2	35.0	.204	.701	2	S.	1.0	44.5	54.8	34.2	.198	.460	8	S.	Del. morn. Light rain and threatening afternoon.
3	38.2	44.2	31.0	.173	.594	0	N.	0	50.0	58.2	42.6	.273	.562	0	S.W.	Sharp morn.; heavy dew. Del. afternoon.
4	45.8	52.8	38.8	.236	.590	5	N.	0	55.5	65.2	47.7	.331	.532	2	S.	Ag. morn. Beautiful afternoon.
5	40.2	55.2	25.2	.131	.300	2	N.	0	60.2	65.8	55.7	.444	.699	5	S.W.	Del. morn. Beautiful mild afternoon.
6	47.8	56.2	39.4	.242	.535	0	N.	0	57.8	66.2	51.1	.376	.584	5	S.	Ag. morn. Del. afternoon, very mild.
7	46.0	53.2	38.8	.236	.581	10	S.	0	52.8	64.0	42.7	.274	.460	10	S.	Mild morn. Beautiful afternoon.
8	50.0	54.2	45.8	.309	.734	5	S.	0.6	46.2	47.8	44.4	.293	.880	10	S.	Ag. morn.; heavy rain at 4 a.m. Disagreeable afternoon.
9	41.0	41.2	40.7	.254	.981	10	S.	1.875	45.0	45.2	44.8	.297	.983	10	N.	Heavy rain all morn. Sharp afternoon.
10	40.0	43.5	35.8	.210	.742	0	S.	0.6	48.5	51.8	45.2	.302	.782	10	N.	Ag. morn. Beautiful afternoon; heavy rain at 10 p.m.
11	40.0	44.8	34.2	.198	.667	0	W.	0.350	49.2	54.0	44.4	.293	.700	10	E.	Del. morn. Ag. afternoon. Thunder.
12	48.8	55.0	42.6	.273	.630	0	N.	0	54.2	61.0	48.1	.336	.626	5	S.	Ag. morn. Beautiful afternoon.
13	38.2	38.5	37.8	.227	.970	10	S.	0.380	50.2	58.8	42.5	.272	.548	8	S.	Disagreeable morn.; heavy rain. Ag. afternoon.
14	40.0	50.5	29.5	.161	.438	0	S.	0.2	54.2	58.8	50.1	.362	.730	2	S.	Del. morn. Beautiful afternoon.
15	40.2	56.2	24.2	.125	.377	0	S.	0	54.8	62.8	47.6	.330	.577	2	S.	Ag. morn. Pleasant afternoon.
16	39.8	48.8	29.9	.164	.475	8	S.W.	0	47.8	52.2	43.4	.282	.721	10	S.	Threatening in morn. Strong wind in aft. Drizz. rain.
17	47.0	51.5	42.5	.272	.714	10	S.	0.1	50.0	58.2	42.6	.273	.562	8	S.	Ag. morn. Del. afternoon, very mild.
18	48.2	50.0	46.2	.313	.867	5	S.	0	50.2	60.0	41.4	.261	.504	2	S.	Del. morn. Mild afternoon.
19	40.8	48.8	32.0	.181	.525	0	S.	0	58.2	61.0	55.7	.444	.827	10	S.	Ag. morn. Showery afternoon.
20	42.8	54.8	30.8	.171	.398	0	N.	0.2	57.0	61.0	53.4	.409	.762	5	S.	Pleasant morn. Del. afternoon.
21	42.0	48.8	34.5	.200	.580	2	S.	0	54.8	60.2	49.9	.360	.690	5	S.	Del. morn.; very mild. Pleasant afternoon.
22	42.5	48.8	35.6	.209	.606	0	S.	0	51.5	62.2	41.9	.266	.475	8	S.W.	Sharp morn. Del. afternoon; mild.
23	46.0	51.2	40.8	.255	.676	10	N.	0	48.2	50.2	46.0	.311	.854	5	S.E.	Ag. morn. Beautiful afternoon.
24	39.8	40.0	39.5	.243	.980	10	E.	0.9	45.5	46.2	44.7	.296	.946	10	E.	Heavy rain all morn. Torrents of rain all day.
25	50.0	54.8	45.2	.302	.702	8	S.W.	0.85	48.2	52.8	43.6	.284	.710	8	S.	Ag. morn. Del. afternoon.
26	42.5	48.8	35.6	.209	.606	2	S.	0	58.2	60.0	56.6	.459	.866	2	S.	Del. morn. Beautiful afternoon.
27	48.5	52.0	45.0	.299	.771	8	S.	0	54.2	58.8	50.1	.362	.730	8	S.	Pleasant morn. Del. mild afternoon.
28	44.2	44.5	43.8	.286	.973	10	S.	0	48.0	48.2	47.8	.333	.985	10	S.	Disagreeable morn.; heavy rain all day.
Sums	1211.5	1383.7	-	-	-	122	-	8.205	1434.7	1585.9	-	-	-	186	-	
Means	43.3	49.4	36.6	.217	.615	-	-	-	51.2	58.6	46.8	.314	.684	-	-	

METEOROLOGICAL OBSERVATIONS taken at New Quito Chinchona Plantation, Kangra Valley, for the Month of March 1865.

Latitude, 32° 7' 8" N.; Longitude, 76° 28' 35" E. Height above the Sea, 4,500 feet.

Day of the Month.	OBSERVATIONS TAKEN AT 9.30 A.M.								OBSERVATIONS TAKEN AT 3.30 P.M.								REMARKS.
	Wet Bulb Thermometer.	Dry Bulb Thermometer.	Dew Point Computed.	Elastic Force of Vapour.	Humidity.	Rain.	Cloud.	Wind.	Wet Bulb Thermometer.	Dry Bulb Thermometer.	Dew Point Computed.	Elastic Force of Vapour.	Humidity.	Rain.	Cloud.	Wind.	
1	46.8	47.0	43.8	.318	.985	2.725	10	N.	46.8	50.5	43.1	.279	.758	-	10	N.	Heavy rain all night, and during day.
2	43.0	43.0	43.0	.278	1.000	3.225	10	N.	45.0	45.0	45.0	.299	1.000	-	10	N.	Disagreeable morn. Torrents of rain all day.
3	43.5	43.5	43.5	.283	1.000	4.950	8	N.	46.8	46.8	46.8	.320	1.000	-	10	N.	Heavy rain all day. Dense fog in evening.
4	45.8	48.8	42.5	.272	.788	1.225	10	N.	55.8	60.0	52.0	.388	.749	-	5	S.	Hail in morn. Del. afternoon; very mild.
5	50.0	56.8	43.9	.287	.621	0	8	S.	50.8	54.5	47.1	.324	.762	-	8	N.	Beaut. morn. Ag. afternoon; a few drops of rain.
6	44.0	48.8	38.7	.235	.681	0	0	E.	58.8	60.2	57.5	.474	.908	-	8	N.	Sharp morn. Pleas. afternoon; hail in evening.
7	44.8	48.5	40.7	.254	.745	0.1	0	N.	55.5	60.0	51.4	.380	.734	-	5	N.	Del. morn. Afternoon very mild.
8	46.0	53.5	38.5	.234	.571	0	2	N.	58.8	60.8	57.0	.466	.874	-	0	N.	Beaut. morn. Pleas. afternoon.
9	44.8	58.0	32.9	.188	.390	0	0	N.	60.0	66.2	55.0	.433	.672	-	2	N. W.	Ag. morn. Beaut. afternoon.
10	46.5	54.8	42.2	.269	.626	0	8	S. W.	54.5	60.0	49.5	.354	.683	-	10	S.	Beaut. morn. Del. mild afternoon.
11	48.5	49.0	47.9	.334	.960	0	10	S.	50.2	50.5	49.9	.360	.978	-	10	S. W.	Threat. in morn. Disagreeable afternoon; heavy rain.
12	45.8	48.5	42.8	.276	.809	1.175	10	S. E.	55.5	60.8	50.7	.370	.694	-	5	S.	Disagreeable morn. Driz. rain. Del. afternoon.
13	44.5	50.0	38.4	.233	.645	0.05	0	W.	55.5	65.8	47.3	.326	.513	-	5	S. W.	Sharp morn. Heavy dew. Beaut. afternoon.
14	46.5	54.5	42.5	.272	.640	0	5	S.	60.0	66.8	54.6	.427	.650	-	0	S. W.	Beaut. morn. Pleas. afternoon.
15	48.8	56.5	41.9	.266	.680	0	0	N.	58.8	65.5	53.4	.409	.651	-	0	N.	Del. morn. Ag. afternoon; very mild.
16	52.0	60.5	44.3	.292	.554	0	2	S.	58.8	68.5	51.0	.374	.587	-	0	S.	Ag. morn. Beaut. afternoon.
17	53.0	63.0	44.0	.288	.500	0	0	S.	55.2	64.5	47.8	.333	.549	-	0	S.	Beaut. morn. Pleas. afternoon.
18	55.0	66.5	45.8	.309	.475	0	0	S.	58.8	68.2	51.8	.378	.549	-	0	S.	Del. morn. Beaut. afternoon; very mild.
19	56.5	62.5	54.9	.432	.763	0	0	N.	60.0	68.8	53.0	.403	.572	-	0	S.	Del. morn. Ag. afternoon.
20	50.8	58.8	43.6	.284	.573	0	0	N.	60.8	67.5	55.4	.439	.652	-	0	S.	Ag. morn. Beaut. afternoon.
21	50.5	60.8	41.2	.259	.486	0	0	N.	58.5	68.2	50.7	.370	.537	-	0	S.	Beaut. morn. Del. afternoon; mild.
22	57.2	63.5	51.5	.361	.650	0	2	S. W.	60.5	75.5	50.0	.361	.409	-	5	S. W.	Del. morn. Hazy; beaut. afternoon.
23	59.2	75.8	47.6	.330	.370	0	2	S. E.	64.5	75.2	57.0	.460	.534	-	2	S.	Beaut. morn. Pleas. afternoon.
24	48.8	60.2	38.5	.234	.448	0	0	N.	60.2	75.0	49.8	.358	.412	-	2	S.	Ag. morn. Beaut. afternoon.
25	53.8	73.0	38.4	.233	.287	0	2	S.	59.5	67.8	52.9	.401	.589	-	2	S.	Del. morn. Ag. afternoon.
26	56.2	68.5	50.0	.361	.518	0	0	S. E.	70.0	77.5	64.7	.611	.648	-	2	S.	Beaut. morn. Del. afternoon; very mild.
27	60.0	70.2	51.8	.386	.523	0	2	S.	65.2	75.8	57.8	.479	.538	-	0	S.	Del. morn. Beaut. afternoon.
28	60.0	73.5	50.5	.368	.446	0	0	N.	70.0	78.5	64.0	.596	.612	-	0	S.	Pleas. morn. Del. afternoon; very warm.
29	65.2	69.8	61.5	.546	.750	0	0	S. E.	68.8	78.5	62.0	.556	.571	-	0	S. W.	Del. morn. Pleas. afternoon; very warm.
30	59.5	64.2	55.3	.438	.730	0	0	N.	71.2	80.5	64.7	.611	.588	-	0	S.	Beaut. morn. Afternoon, sun very warm.
31	54.8	68.2	44.1	.289	.419	0	0	N.	72.1	85.2	62.9	.574	.474	-	2	S.	Del. morn. Beaut. afternoon.
Sums - -	1580.8	1820.2	-	-	-	13.450	91	-	1826.9	2048.6	-	-	-	-	103	-	
Means -	51.3	58.7	44.6	.295	.596	-	-	-	58.9	66.1	53.1	.404	.630	-	-	-	

New Quito, 31 March 1865.

(signed) J. McKay.

OF THE CHINCHONA PLANT INTO INDIA.

— VI. —

CHINCHONA CULTIVATION IN THE BOMBAY PRESIDENCY.

— No. 1. —

EXTRACT of a DESPATCH from the Secretary of State for India to the Government of Bombay.

31 December 1862.

5. I DESIRE that you will furnish me with a Report of the experimental sowing of Chinchona seeds at Mahabaleshwur, which were sent there by Mr. Dalzell in 1861.

— No 2. —

EXTRACT from the ANNUAL REPORT on the Hill Station of Mahabaleshwur, Bombay, for 1863, by Dr. *H. Cook*, Superintendent.

20 February 1864.

THE site for the Chinchona plantation has been fixed at Lingmulla, on the banks of the Yenna, above the waterfall. I was induced to select this spot, as it seemed to offer all, or nearly all, the natural advantages essential to the success of the cultivation of the Chinchona. These are briefly, a northern aspect, the disposal of the ground in narrow terraces, protection from prevalent winds, a good soil and subsoil, a plentiful supply of running water, and the least possible rainfall. As the rainfall at Sindola Park is 60 inches less than that at Malcolm-penth, and as a high peak intervenes between this and Lingmulla, I am hopeful that the rainfall at the latter place will not exceed 150 inches. If this prove to be the fact, there need be no fear of the success of the experiment. A house for the local superintendent of the plantation, propagating houses, &c. are to be immediately constructed, and if the sanction of the Government to construct a good branch road from the Paunchganny-road to the site be obtained, this lovely spot will, I feel sure, become a favourite place of resort to visitors, and an added charm to the station.

— No. 3. —

EXTRACT of a DESPATCH from the Secretary of State for India to the Government of Bombay.

16 December 1864.

THE reference made by Dr. Cook to the plantation of Chinchona, at Lingmulla, leads me to hope that the experiment will be successful. In paragraph 5 of my Despatch of the 31st of December 1862, I desired that I might receive a Report on the Chinchona seeds sent by Mr. Dalzell to Mahabaleshwur, in 1861. None has yet been sent, and I have to desire that you will supply the omission.

— No. 4. —

EXTRACT from the ANNUAL REPORT on the Hill Station of Mahabaleshwur, Bombay, for 1864, by Dr. *H. Cook*, Superintendent.

23 January 1865.

THE Chinchona plantation at Lingmulla, which was commenced last year, has been established. The plants have thriven, and many of them have attained a height of above three feet. The services of a soldier from the Artillery, who understands gardening, has been granted by Government.

— No. 5. —

From the Bombay Government to the Secretary of State for India.

Bombay Castle, 28 February 1865.

WITH reference to your Despatch, dated the 16th December last, we have the honour to transmit herewith copies of the papers noted in the margin, showing the progress of the Chinchona plants since grown at Mahabaleshwar.

Memorandum from the Acting Revenue Commissioner S. D., 3 February 1865, with accompaniments.
Resolution of Government on the above, 15 February 1865.

Enclosure in No. 5.

From Dr. H. Cook, Superintendent at Mahabaleshwar, to F. S. Chapman, Esq., Collector of Sattara.

Sir,

Mahabaleshwar, 24 January 1865.

I HAVE the honour to forward for your information, and for transmission to Government, the accompanying two monthly Returns of the growth of the Chinchona plants at Lingmulla, the one for the month of November and the other for that of December last.

MONTHLY RETURN of the Growth of Chinchona Plants at Lingmulla for the Month of November 1864.

No.	Height in Inches.	No.	Height in Inches.
1	9½ Inches.	32	1 Foot and 1½ inch.
2	5 Ditto.	33	1 Ditto 11 inches.
3	1 Foot and ½ inch.	34	2 Feet and 7 "
4	1 Ditto 1 inch.	35	1 Foot and 8. "
5	9 Inches.	36	2 Feet.
6	1 Foot and 1 inch.	37	1 Foot and 6 inches.
7	5 Inches.	38	1 Ditto.
8	9 Ditto.	39	1 Ditto and 6½ "
9	9 Ditto.	40	1 Ditto and 7 "
10	10 Ditto.	41	1 Ditto and 8 "
11	1 Foot and 5 inches.	42	2 Feet.
12	6½ Inches.	43	2 Ditto and 11 inches.
13	1 Foot and 1½ inch.	44	2 Ditto.
14	10½ Inches.	45	2 Ditto and 1½ inch.
15	1 Foot and 6 inches.	46	2 Ditto.
16	1 Ditto 8 "	47	2 Ditto and 1 inch.
17	3 Feet.	48	2 Ditto.
18	10 Inches.	49	2 Ditto.
19	1 Foot and 8 inches.	50	1 Foot and 6½ inches
20	1 Ditto 4 "	51	11 Inches.
21	11 Inches.	52	1 Foot.
22	1 Foot and 8 inches.	53	1 Ditto.
23	1 Ditto 4 "	54	11½ Inches.
24	1 Ditto 4½ "	55	1 Foot and ½ inch.
25	1 Ditto 7½ "	56	1 Ditto and 11½ inches.
26	2 Feet.	57	2 Feet and 4 "
27	1 Foot and 9 inches.	58	2 Ditto.
28	1 Ditto 9 "	59	
29	1 Ditto 5½ "	60	
30	2 Feet.	61	
31	1 Foot.	62	

L. Gillingwater,
Acting Assistant Superintendent, G.B.C.,
Chinchona Plantation, Lingmulla.

Lingmulla, 1 December 1865.

MONTHLY RETURN of the Growth of Chinchona Plantation at Lingmulla for the Month of December 1864.

No.	Height in Inches.	No.	Height in Inches.
1	1 Foot.	31	1 Foot and 5½ inches.
2	8 Inches.	32	1 Ditto and 6¼ "
3	1 Foot and 3 inches.	33	2 Feet and 3½ "
4	1 Ditto 5 "	34	2 Ditto 11½ "
5	1 Ditto 1½ "	35	1 Foot and 11½ "
6	1 Ditto 4 "	36	2 Feet and 5½ "
7	7 Inches.	37	1 Foot and 10½ "
8	1 Foot.	38	1 Ditto and 6½ "
9	1 Ditto.	39	1 Ditto and 10½ "
10	1 Ditto and 1 inch.	40	2 Feet.
11	1 Ditto and 10 inches.	41	1 Foot and 11½ "
12	8½ Inches.	42	2 Feet and 7½ "
13	1 Foot and 4½ inches.	43	3 Ditto 4 "
14	1 Ditto ½ "	44	2 Ditto 5 "
15	1 Ditto 10½ "	45	2 Ditto 5½ "
16	1 Ditto 11½ "	46	2 Ditto 5½ "
17	3 Feet and 1½ "	47	2 Ditto 6½ "
18	1 Foot and 1½ "	48	2 Ditto 7½ "
19	2 Feet.	49	2 Ditto 5½ "
20	1 Foot and 7½ "	50	1 Foot and 10½ "
21	1 Ditto and 3½ "	51	1 Ditto 5½ "
22	2 Feet and ½ "	52	1 Ditto 3½ "
23	1 Foot and 11 "	53	1 Ditto 2½ "
24	1 Ditto and 10½ "	54	1 Ditto 1½ "
25	1 Ditto and 11½ "	55	1 Ditto 5½ "
26	2 Feet and 2½ "	56	2 Feet and 7½ "
27	2 Ditto and 1½ "	57	2 Ditto 8½ "
28	2 Ditto and 1½ "	58	2 Ditto 1 "
29	1 Foot and 8½ "	59	Without leaf.
30	2 Feet and 2½ "	60	Ditto ditto.

L. Gillingwater,

Acting Assistant Superintendent, G. B. G.,
Chinchona Plantation, Lingmulla.

Lingmulla, 1 January 1865.

— No. 6. —

EXTRACT from the ANNUAL REPORT on the Hill Station of Mahabaleshwur,
Bombay, for 1865, by Dr. H. Cook, Superintendent.

9 February 1866.

THE Chinchona plantation established last year has progressed favourably. At the close of the year 1864 there were 60 young plants; these have been increased to 270 by layering 40 of their number. This system of propagation is necessarily slow, but, in the absence of a propagating house, it is the only one that has been found to succeed. As the new propagating house will soon be finished, I trust that the number of young plants will hereafter rapidly increase. Twenty of the original stock, planted on the 18th February 1864, have been allowed to grow up, and some of them have already attained a height of six feet. The average growth of these 20 plants during the year have been 3 feet 2½ inches. The average growth of 11 plants at Neddiwuttum, on the Neilgherries, has been for the past three years only 2 feet 9 inches. If, therefore, the present rate of growth is continued at Lingmulla, it will exceed that of the Neilgherry plants.

RESOLUTION of the Bombay Government.

The report as to the growth of Chinchona plants at Lingmulla is very satisfactory; it is hoped that no time will be lost in completing the propagating house.

— VII. —

CHINCHONA CULTIVATION IN CEYLON.

— No. 1. —

EXTRACT from the REPORT on the Royal Botanic Garden at Peradenia, Ceylon, by Mr. Thwaites, F.R.S. (Director).

September 1864.

CHINCHONAS.—Complete success is attending the cultivation and propagation of the different species of Chinchonas now growing in the Hakgalle Garden. The plants exhibit the most perfect condition of health and vigour, and the number of each kind in the following list furnished to me by Mr. MacNicoll shows how successful he has been in their propagation.

LIST of Chinchona Plants in the Hakgalle Garden.

<i>Chinchona succirubra</i> , planted out in the forest	- - - - -	1,345
(The largest plant being 13½ feet high, and the stem at the base 8½ inches in circumference.)		
Ditto	Stock plants, for taking cuttings from	2,380
Ditto	Plants ready for distribution	42,450
Ditto	Cuttings in different stages of rooting	32,800
<i>Chinchona officinalis</i> , planted out in the forest	- - - - -	1,044
(The largest plant being 6½ feet in height, and the stem at the base 5½ inches in circumference.)		
Ditto	Stock plants, for taking cuttings from	1,934
Ditto	Plants ready for distribution	58,747
Ditto	Cuttings in different stages of rooting	47,400
<i>Chinchona crispella</i> (not distinguishable from <i>C. officinalis</i>) planted out in the forest	- - - - -	430
<i>Chinchona micrantha</i> , planted out in the forest	- - - - -	300
Ditto	Stock plants, for taking cuttings from	320
Ditto	Cuttings in different stages of rooting	229
<i>Chinchona Calisaya</i> , Stock plants, for taking cuttings from	- - - - -	82
Ditto	Cuttings in different stages of rooting	24
<i>Chinchona Pahudiana</i> , Stock plants, for taking cuttings from	- - - - -	24
Ditto	Cuttings in different stages of rooting	12

It having been determined by Government that plants of Chinchonas should be distributed, to the extent they could be spared, free of charge to persons residing in the island making applications for them in the following form:

"I, A. B., possessing (or having under my care) available land at _____, suitable for the cultivation of Chinchona, beg to apply for _____ plants, which I undertake to plant upon the said land within 12 months from this date, and to carefully cultivate when so planted."

It is satisfactory to me to be able to report that I have already received applications in the above prescribed form from eighteen planters, and that the aggregate number applied for by them is 28,524: of this number nearly 9,000 have been issued from Hakgalle, and it will be seen by the foregoing list that there will be no difficulty in supplying the remainder at once. I have reason

to believe that I shall, before long, receive applications for many more plants, and I have no fear of being unable to meet them, as Mr. MacNicoll informs me he can furnish plants at the rate of 20,000 per month, if they are required.

The small number of plants of *Chinchona succirubra* growing in the open ground at Peradenia, are making great progress, and are in perfect health, though not so robust in character as plants of the same age at Hakgalle.

A few plants of *Chinchona officinalis*, which were planted by way of experiment at Newera Ellia, were destroyed by a temperature of 24° Fahr. in one of the cold nights of February last, so that it is quite clear it would not be safe to plant Chinchonas in the island much above the elevation of 5,000 feet, or where they would be liable to frosty nights succeeding the exceedingly hot days of the dry season.

I have transmitted to Sir William Hooker, who has kindly promised to have it submitted to analysis for me, a small quantity of bark of *Chinchona succirubra*, from a tree three years old, and I hope to be able to communicate the results in a short time. Dr. De Vry, professional chemist to the Chinchona plantations of Java, who favoured me with a visit a few months ago, took to Europe with him some bark from a tree at Hakgalle which had died, owing to the roots getting into swampy undrained ground, and he found even in this unpromising specimen of bark, more than two per cent. of alkaloids, and of this nearly one per cent. of quinine.

I regret to say that some seeds of *Chinchona Pitayensis*, obligingly sent to me by Mr. Clements R. Markham, in March last, failed altogether to germinate.

— No. 2 —

EXTRACT from the REPORT on the Royal Botanic Garden at Peradenia, Ceylon, by Mr. Thwaites, F. R. S. (Director).

October 1865.

CHINCHONAS.—Again am I able to give highly satisfactory accounts of the progress made in the cultivation of Chinchonas in the island. Many thousands of plants have been distributed from the Hakgalla Garden, and I have received from the various parts of the island where they have been planted, most favourable reports of their perfect health and vigorous growth; and not a single report of an opposite character has yet reached me: so that there appears to be every prospect of quinine becoming, before very long, one of the most important products of the island.

Mr. MacNicoll has been hitherto able to keep up a sufficient supply of healthy, well-rooted plants to meet the demand which has been made at Hakgalla for them. He has supplied 39 applicants, presenting orders from me, with 129,350 plants, in the proportion of three-fourths of *C. succirubra* and one-fourth of *C. officinalis*.

Up to the present date I have received applications, in the prescribed form, from 43 persons, for altogether 439,274 plants. Three of the applicants requested each to have as many as 100,000 allotted to them, if such a number could be spared. Plants are distributed without stint to the utmost extent of the capabilities of the Hakgalla Garden. I would suggest, however, to persons who may have an intention of cultivating Chinchonas very extensively, that it would be very desirable for them to establish nurseries upon their estates, for the propagation of the plant by cuttings. The operation is a very simple one, and an ordinary cooly labourer could be taught it in a few days at Hakgalla, whither he might be sent for the purpose.

LIST of Chinchona Plants now in Hakgalla Garden.

<i>Chinchona succirubra</i> , planted out (the largest plant being 17 feet in height and the trunk 12½ inches in circumference at the base)	1,345
Ditto — Stock plants for taking cuttings from	2,380
Ditto — Plants fit for distribution	63,158
Ditto — Small plants and cuttings in different stages of growth	78,290

Chinchona

<i>Chinchona officinalis</i> , planted out	1,044
Ditto - Stock plants for taking cuttings from	1,934
Ditto - Plants fit for distribution	109,845
Ditto - Small plants and cuttings in different stages of growth	93,880
<i>Chinchona crispella</i> , (not distinguishable from <i>C. officinalis</i>) planted out	430
<i>Chinchona micrantha</i> , planted out	600
Ditto - Small plants and cuttings	612
<i>Chinchona Calisaya</i> , planted out	100
Ditto - Small plants and cuttings	261
<i>Chinchona Pahudiana</i> , planted out	25
Ditto - Small plants and cuttings	122

I have not yet received from Kew the result of Mr. Howard's analysis of the specimens of Chinchona bark from Hakgalla and from this garden, which were sent to England some months ago. As soon as it reaches me, I shall make it known without loss of time.

Several of the plants of *Chinchona officinalis* at Hakgalla are producing seeds, and one plant of *C. succirubra* is coming into flower.

Some seeds of *C. officinalis* collected at Loxa, and sent to me from Kew, have unfortunately not germinated.

I am not losing sight of the importance of ascertaining, as soon as possible, firstly, the period of growth at which the bark may be most profitably removed from the different species of Chinchona respectively; secondly, the best season for removing it; and thirdly, in what state it is desirable it should be sent to Europe; whether merely dried and carefully packed, and, if so, how this may be best accomplished; or whether, as was suggested to me by Dr. De Vry, some preliminary simple chemical process may not be carried out in the island, which, by eliminating what is of no value, may very much reduce the bulk of the article to be exported. As soon as I succeed in getting any reliable information on these points, I shall lose no time before communicating it.

— No. 3. —

From Mr. Clements R. Markham to the Colonial Secretary, Ceylon.

Sir,

Colombo, 18 November 1865.

I HAVE the honour to inform you that I have inspected the Chinchona Plantation at Hakgalla, and one of the large coffee estates (that of Rothschild) where several acres have been planted with Chinchona, in company with Mr. Thwaites. The site of the plantation at Hakgalla has been so admirably selected, and resembles so closely the native habitat of the Chinchona in South America, that the healthy growth of the plants there must have been a certainty from the first, and the skill of Mr. MacNicoll in propagating has already made Hakgalla a thoroughly efficient nursery for the supply of a practically unlimited number of plants. This portion of the work is in such excellent hands that it would be presumptuous on my part to offer any suggestions, even if I had any to make; but it has occurred to me that the information derived from the analysis of bark in England, and the deductions obtained from it with regard to the probable commercial advantages of Chinchona cultivation, might advantageously be furnished to individuals who have embarked in this important enterprise, from time to time.

2. I shall take care that, in future, all papers on this subject are transmitted to Ceylon without delay; and in the meanwhile it may be useful that I should offer some remarks on the cultivation which has been so generally entered upon by the enterprising planters of Ceylon, with special reference to the recent scientific investigations by Mr. Howard, the great quinine manufacturer in London.

B. I am informed by Mr. Thwaites that as many as 500,000 Chinchona plants have been applied for, and that 180,000 have actually been distributed, so that there is clearly a serious intention among the planters to make Chinchona bark

one of the staple products of the island. On the Rothschild estate several acres are planted with trees of the *Succirubra* or "red bark" species, and, though fully exposed to the effects of the sun and wind, on a hill-slope, denuded of trees, they now present an exceedingly robust and healthy appearance. The span of the branches, the condition of the leaves, and the girth of the stems, all indicate vigour of growth which promises the best results for the future, and although these plants are only 3,200 feet above the sea, there is reason to hope that an analysis of their bark will show a yield but little less favourable than that obtained from bark grown on the Neilgherry Hills in Southern India. I propose, therefore, to state briefly, and in general terms, the results of four successive experiments which have been made on barks sent home from the Neilgherries, in order that some idea may be formed of the probable yield from barks of the same species grown in Ceylon.

4. In May 1863 some bark was cut at a period when the sap was beginning to rise. The product of rough alkaloids in this bark proved to be 4.3 per cent., of purified alkaloids 3.4 per cent., of which 2.4 was quinine. On this occasion, Mr. Howard remarked that the bark cutting should take place as soon as the bark is thick enough to repay cultivation, and that there is positive disadvantage in allowing bark to attain the age indicated by the samples imported from South America, because there is a continual process of deterioration after a certain period in the bark's history. The point to ascertain is the exact time when it has reached its fullest stage of development.

5. The second analysis by Mr. Howard was of bark taken in October 1863, during the rains, when the sap is in full flow. This bark, 18 months old, yielded 6 per cent. of rough and 5 of purified alkaloid. In the following month the bark of a *C. succirubra* tree, aged one year and six months, was delivered to Dr. De Vry, the eminent Dutch chemist. It had been thickened by moss, and he obtained the hitherto unprecedented yield of 8.4 per cent. of alkaloids, of which 2.7 was quinine.

6. The third analysis by Mr. Howard was of bark taken in February 1864, when the plants were in a state of rest. Two lower branches were removed from a plant which had been in the ground for two years and five months, and they yielded 8½ ounces of dry bark. This bark contained 6 per cent. of purified alkaloids, of which 3.14 was quinine, 2.06 chinchonidine, and 0.80 chinchonine. Mr. Howard considered that this large yield might be still further increased by surrounding the stems with moss, and he also came to the conclusion that February was the most favourable time for taking the bark.

7. The fourth and most recent analysis was of bark cut early in April 1865, at the time when the sap begins to rise. It was found that the system of removing strips of bark from the stem can be practised without injury, provided that the wound is instantly covered with damp moss. This bark contrasted most favourably with the average specimens from South America. It was three years and five months old, and had been thickened by the application of moss. The alkaloids were in a state of purity such as is not found in South American red barks, and it was evident that cultivation had improved the yield of this species. Mr. Howard, on this occasion, used the analysis which is followed to ascertain the commercial value of the bark, depending chiefly on the amount of crystallizable sulphates. His result was eight per cent. of alkaloids, of which six per cent. was crystallized sulphate, 0.94 soluble in ether, and 1.06 insoluble. Dr. De Vry, who was furnished with some of the same bark, adopted a method of analysis which gave him the total amount of febrifuge alkaloids. He pronounced it to be the most valuable specimen he had ever manipulated, and obtained the extraordinary yield of 11 per cent. of alkaloids! Another very important point in this investigation was the analysis of bark re-produced on a portion of the stem which had yielded the bark given to Dr. De Vry, in November 1863. This second harvest of bark was thus one year and five months old, and it yielded 7.7 per cent. of alkaloids, of which five per cent. was crystallizable sulphates. During the summer of the present year, Mr. Howard has also analysed bark of *C. officinalis* at an age of one year and seven months, which gave 1.5 per cent. of alkaloids; and bark of *C. micrantha* two years and five months old, thickened by moss, which yielded as much as 5.82 of crystallized sulphate of quinidine.

8. The

8. The highly promising results of these several investigations of bark grown on the Neilgherry Hills are manifest, and the following deductions may be drawn from them. 1. That the yield of chinchona plants under cultivation increases two and threefold, even during the first three years of growth, as compared with the yield of barks imported from South America. 2. That not only may a large yield be obtained from branches lopped from the tree, but that strips may even be taken from the stem, without injury to the tree, provided that damp moss is placed on the wound immediately. 3. That the application of damp moss tends materially to thicken the bark. 4. That bark from the young branches of *C. officinalis*, of plants only a year and a half old, is recognised by experienced dealers in London as identical with the famous "thin rusty crown" of commerce, which fetches 1 s. 3 d. to 1 s. 4 d. per lb., and is generally used by chemists in making the various preparations of Peruvian bark. 5. That the bark of *C. micrantha*, which produces Chinchonine and nothing else in its wild state, has under cultivation been brought to yield the far more valuable febrifuge called quinidine. 6. That the red bark of India and Ceylon will fetch as high a price as the *Calisaya* of Bolivia, the most valuable of all the barks (4 s. per lb.).

9. It has often been suggested that the bark might be greatly reduced in bulk for transmission to the London market, by adopting some cheap chemical process, with a view to eliminating the woody and other useless parts. Mr. Howard, however, is of opinion that it would not be profitable to bring the bark into a smaller bulk for facility of transport. His reasons are founded partly on the complexity of the organic constituents of the bark, leading (especially under the influence of lime or alkalis) to deteriorating changes in the alkaloids, and partly on the tendency of the heat to which the bark must be subjected, to operate in the same direction.

10. There is another point to which I think it particularly important that the attention of the Government of Ceylon should be directed. There are four febrifuge substances in Chinchona bark, found in larger or smaller proportions according to the species. These are quinine, quinidine, chinchonidine, and chinchonine. At present, the first of these is alone of great commercial value. Yet it is the opinion of the most eminent chemists in Europe that quinidine and chinchonidine are of nearly equal efficacy, while chinchonine is by no means devoid of febrifuge virtue. The presence of these alkaloids, other than quinine, is at present, therefore, a disadvantage in a commercial, but not in a medicinal point of view; and looking to the large yield of chinchonidine in our *C. succirubra*, and of quinidine in our *C. micrantha* plants, it becomes a matter of the utmost importance to clear away all prejudice and error on this point. Chinchonidine, I may remark in passing, was undoubtedly the therapeutic agent in the famous cure of the Countess of Chinchon in 1639, who gave her name to the genus, and its febrifuge value has been recognised by the late Dr. Royle, by M. Briquet, the eminent French quinologist, by Mr. Howard, and by Dr. De Vry. The true position of these febrifuges may be established by appointing commissions, consisting of medical men, to report upon them; and with this view the Secretary of State for India has issued the instructions contained in the enclosed despatch to the Madras Government, dated 30th September 1865, to which I would venture to invite particular attention. A similar measure adopted by the Ceylon Government might materially assist the common object in view.

11. From paragraphs 4 to 8 of the same despatch, it will be seen that it is contemplated to establish a manufactory of some cheap form of the Chinchona febrifuge in India. I am aware that measures of this nature do not come within the scope of the Ceylon undertaking, and I have therefore confined myself in this letter to points, which appear important to planters, who cultivate with a view to commercial profit. In this point of view the enterprise is, however, a very important one, likely to advance the prosperity of the colony, and to prove a material blessing to its inhabitants.

12. A periodical analysis of the bark actually grown on coffee estates from 3,000 to 4,500 feet above the sea, is very essential, in order that cultivators may see their way; and I would strongly recommend that they should be made aware of the importance of this measure. In conclusion, I must express my admiration at the zeal and ability with which this great undertaking has been

conducted by Mr. Thwaites and his assistant Mr. MacNicoll; and at the thorough efficiency of the plantation at Hakgalla, which so completely secures the objects contemplated by the Government.

I have, &c.
(signed) *Clements R. Markham.*

The Honourable the Colonial Secretary, Colombo.

P.S.—I also beg to enclose a copy of Mr. Howard's most recent report of an analysis of Chinchona bark which is referred to in the despatch from Sir Charles Wood. Portions of the information might advantageously be printed and circulated for general information.

— No. 4. —

Mr. Clements R. Markham to the Under Secretary of State for India.
Report on Chinchona Cultivation in Ceylon.

Sir,

Colombo, 18 November 1865.

I HAVE visited and inspected the Government Chinchona plantation in Ceylon, as well as some of the coffee estates where the cultivation has been undertaken, and now have the honour to report the results of my observations. The Secretary of State in Council will thus be fully informed respecting the position and prospects of the experiment in Ceylon, when questions relating to Chinchona cultivation in India are submitted for consideration.

2. The plants in Ceylon, with the exception of those of *C. Calisaya*, which came from Java, are entirely derived from seeds procured from South America under my superintendence, at the expense of the India Office, and the Ceylon cultivation may therefore be considered as a branch of the great undertaking which has been successfully carried out under the auspices of the Secretary of State for India.

3. In Ceylon, the Chinchona experiment is under the able superintendence of Mr. Thwaites, the Director of the Botanical Garden at Peradenia, and the cultivation is conducted, under him, by Mr. M'Nichol, a very intelligent gardener, who resides on the spot. The first plants arrived in 1861, when the site for a plantation was selected by Mr. Thwaites, and the work commenced.

4. The knot of mountains in the central province of Ceylon, which at one point attains a height of 8,280 feet above the sea, is entirely composed of gneiss with veins of quartz. The soil formed by the disintegration of this rock is not rich, not to be compared with the fertile loam produced by the more modern volcanic rocks of Java, but this poverty of soil is made up for by abundant supplies of water and a genial climate. The valleys formed by the mountain spurs are extensively cleared and planted with coffee, but there is still a good deal of forest on the higher elevations, and on one of the highest plateaux is the hill station of Neuera-Ellia, 6,220 feet above the sea. From Kandy the mountains are ascended, on their northern face, by an excellent road, and, as Neuera-Ellia is approached, the *flora* resembles closely that of the Pulneys, or of the Neilgherries, near Coonoor. The woods are, like those of the Southern Indian hills, composed of *Michelia*, *Symplocos*, *Gaultheria*, *vaccinium*, myrtles, with an undergrowth of *Lobelia excelsa*, balsams, *Osbeckia* and *Sonerila*, *Solanum Indicum*, a passion-flower, and madder. Beautiful tree ferns grow in the shade, and the *Rhododendron arboreum* is scattered over the open grass land. The station, consisting of bungalows nestling amongst Australian trees, is on a plain, bounded on the east and west by tree-covered hills, crested here and there by bare ridges of gneiss. The masses of cryptogams on the branches and stems of the trees indicate the extreme dampness of the climate.

5. The Chinchona plantation is at a place called Hak-galle, six miles south of Neuera-Ellia, and 5,200 feet above the level of the sea. The position is admirably chosen. Hak-galle is a magnificent perpendicular cliff, rising out of a fine forest which clothes the steep slopes of the mountain. The site faces the north-east. It is protected from the full force of the south-west monsoon by the cliff, while it receives a good supply of rain during both seasons. Half a mile on the road towards Neuera-Ellia the effects of the north-east monsoon are

are lost, and about a mile in the other direction is the limit of the influence of the south-west monsoon. Thus Hak-galle is exactly situated so as to receive ample supplies of moisture throughout the year. No place in the East has so vividly reminded me of the Chinchona *pajonales* of Peru as the view from the Hak-galle plantation. A mountain torrent dashes through the wide ravine, and the hills on either side are clothed with alternate forest and grass land, while to the south are the distant hills and valleys of the Oovah district. These open grass lands, called *patenas* in Ceylon, are precisely analogous to the *pajonales* of Peru. They are of frequent occurrence in the Ceylon hills, being covered with coarse tufts of lemon grass (*Andropogon schenanthus*), and the forest stopping abruptly on their verge. No trees grow on these *patenas*, except the *rhododendron* and a very few others, and they are considered unsuitable for coffee cultivation. On the day of my visit to Hak-galle there were showers from the south-west in the forenoon, and in the afternoon a dense mist rolled up from the Oovah valleys to the east, and enveloped the plantation. This is exactly the course of atmospheric daily change in the uplands of Caravaya, and as I watched the white mist wrapping tree after tree in its thick folds, I almost fancied myself standing on a Chinchona *pajonel* in Peru.

6. Some eight or 10 acres have been cleared on the forest-covered slope under the grand old Hak-galle cliff, and about five are now planted with Chinchona trees. It is worthy of remark that, although the roots of the felled trees have been allowed to remain in the ground, the Chinchona have in no instance been attacked by fungi, as was the case in Java. The plants are completely in the open, and look remarkably healthy and vigorous. In the lower part of the clearing are the *C. succirubra*, which average a height of from eight to 10 feet. Several are in flower. The largest tree is 18 feet 6 inches high, with a stem 14 inches in girth at the base. It was planted in February 1862. The *Calisaya* trees are smaller, but look healthy; and the *C. micrantha* look remarkably strong. The *C. officinalis* trees, of which kind about 4,000 are planted out, are in the upper part of the clearing; they grow very fast, and have already yielded an abundant supply of seeds.

7. The nurseries for cuttings and young plants are beds containing many thousands placed close together, and merely shaded from the heat of the sun by a moveable roofing of grass. An ordinary cooly puts in the cuttings, and the loss only amounts to a half per cent.; 2,000 plants of *C. succirubra* have been raised from buds placed in drills, in the same way as French beans are raised, with half an inch of earth over them, and 90 per cent. came up; and of the *C. officinalis* seeds (30 in each capsule) all came up. The total number of plants and cuttings is now upwards of 500,000. With reference to the method of taking the bark, I found that a tree of *C. succirubra*, which was cut down at Hak-galle for bark analysis in April 1864, had, in November 1865, put up another shoot perpendicularly from the side of the old stem, which was 5 feet high and 5 inches in girth near the ground.

8. The most cheering feature in the Chinchona cultivation of Ceylon is the hearty way in which it has been taken up by the coffee planters. The facility for acquiring good titles, the excellence of the roads, and other advantages, probably render them, as a body, more enterprising than their brethren in India, and this important experiment is evidently destined to receive a fair and complete trial at their hands. The plants are given away by the Government,* the only expense to the cultivator being their carriage to his estate. As many as 50 planters have made applications for plants, 500,000 plants have been asked for, and 180,000 actually distributed.

9. One of the most energetic Chinchona cultivators is Mr. Corbett, who manages the estate of Rothschild, at Pusilawe (on the road from Peradenia to Nuera-Ellia), for the Ceylon Company. It may be looked upon as a representative estate. The coffee plants occupy the slopes on both sides of the Pusilawe

* The following form of application for Chinchona plants is in use in Ceylon:—

"I, A. B., possessing (or, having under my care) available land at _____, suitable for the cultivation of Chinchonas, beg to apply for _____ plants, which I undertake to plant upon the said land within 12 months from this date, and to carefully cultivate when so planted.

"Dated _____

"(signed) A. B.

"To the Directors of the Royal Botanic Gardens, Peradenia."

Pusilawe valley, extending to the very crown of the grand hills of Mooneragalle, whose battlemented ridges of gneiss bound the view to westward. Excepting a clump of jacks high up on the eastern side, and some palms near the houses, every tree has been felled as far as the eye can reach, and rows of coffee plants entirely occupy the site of the primeval forest. No regard whatever has been paid to forest conservancy, belts of verdure are neither left along the watercourses nor on the hill tops, and planters have to send many miles for their firewood; yet there has been no sensible diminution of the water supply, and cascades and torrents dash over masses of rock through this coffee-covered valley.

10. About four acres have been planted with Chinchona trees on the Rothschild estate, on a steep hill slope, facing the east, all except one being of the red bark species. There are about 2,500 plants, or 600 to an acre, planted 12 feet apart, alternating with coffee bushes; they are fully exposed to the full blaze of the sun, yet nothing can be more vigorous and healthy than their appearance. The oldest had been in the ground nearly three years, and are 12 feet high and 8 feet across the branches, with stems 13 inches in girth near the ground; but the majority of the plants were about 20 months old, with stems eight inches in girth. Mr. Corbett is about to plant 600 acres with Chinchona plants at another estate, called Deek-oya, which is 4,000 feet above the sea. Rothschild only has an elevation of 3,200 feet. He has applied for 100,000 plants, and has already received 10,000; and he calculates that, after three years, the cost of cultivation will be 6 *l.* an acre, exclusive of original price of land and interest of money. This will ensure a very remunerative return on the sale of the bark.

11. The object of the Ceylon Government in establishing the Hak-galle plantation is confined to supplying Chinchona to individuals who are willing to undertake the cultivation, and the extensive plantations of the Neilgherries, where a far grander and more important system is contemplated, would therefore be out of place here. The expenditure on Hak-galle is only 500 *l.* a year, 250 *l.* of which is the salary of Mr. M'Nicholl, the gardener; but the Hak-galle plantation fully secures the object for which it was established; it is admirably managed by Mr. M'Nicholl, and it forms a most efficient source of supply for the issue of young plants. I have no doubt whatever that Chinchona cultivation, under the auspices of the enterprising planters of Ceylon, will prove a great commercial success, and be a benefit of no small value to the inhabitants of the island.

12. I sail for Tuticorin on the 19th instant, in a native small craft, in order to visit the pearl oyster nursery, and to deliver the instruments and instructions respecting the aquaria to Captain Phipps. Dr. Cleghorn, the Conservator of Forests, with the permission of Sir William Denison, is to meet me at Palamcottah, and to travel with me, by way of Travancore, to the Neilgherry Hills.

The Under Secretary of
State for India.

I have, &c.
(signed) *Clements R. Markham.*

— No. 5. —

REPORT on Specimens of Chinchona Bark grown in Ceylon by
John Eliot Howard, Esq.

11 July 1866.

I HAVE the honour to report, for the information of Her Majesty's Government, on the four samples of bark received from Mr. Thwaites of Ceylon. I must remark, in the first place, that they contrast disadvantageously in appearance with the specimens of Chinchona bark received from Mr. McIvor. It looks as though the climate of Ceylon were less favourable than that of Ootacamund for the cultivation of this plant. No. 1 in particular, and next to this No. 3, would be considered poor and badly grown barks in commerce, and moreover they have not had the advantage of "mossing," which leads so much to increase the product

duct of the alkaloids. The yield, under these circumstances, is more favourable than I expected, especially from the *Condaminea* bark, concerning which it would be important to know whether it is the *C. officinalis* (var. *Uritusinga*) or some other variety.

No. 1. *C. succirubra* bark taken from trees growing in the forest under dense shade. Plants planted out 8th February 1862, yields,—

Sulphate of quinine -	-	-	-	-	-	-	-	1.48
Chinchonidine -	-	-	-	-	-	-	-	0.61
Chinchonine -	-	-	-	-	-	-	-	2.54
TOTAL - - -								4.63

The proportion of chinchonine in this sample is very remarkable. In the next the quinine and chinchonidine may be looked upon as more than doubled, and the chinchonine reduced by three-quarters.

No. 2. *C. succirubra* bark taken from trees growing in the open garden, planted 25 feet apart. Plants planted out 8th February 1862,—

Sulphate of quinine -	-	-	-	-	-	-	-	2.35
Uncrystallized quinine -	-	-	-	-	-	-	-	0.95
Chinchonidine -	-	-	-	-	-	-	-	1.11
Chinchonine -	-	-	-	-	-	-	-	0.58
TOTAL - - -								4.99

No. 3. *C. succirubra* bark taken from trees planted in the open garden, six feet apart. Plants planted out on 1st June 1863,—

Sulphate of quinine -	-	-	-	-	-	-	-	1.90
Uncrystallized quinine -	-	-	-	-	-	-	-	1.18
Chinchonidine -	-	-	-	-	-	-	-	0.53
Chinchonine -	-	-	-	-	-	-	-	0.32
TOTAL - - -								3.93

It seems, from these two last experiments, that the plants have done better six feet apart than 25 feet apart, having made more quinine in proportion to the time, and less chinchonine and chinchonidine. Further experiments are needed to confirm this conclusion.

No. 4. *C. Condaminea* (variety?). This has much the appearance of bark grown in Peru. The climate of Ceylon seems to suit it, which is quite probable, as the scorching heat of the sun, which destroys this plant, does not seem to injure the coarser texture of the large-leaved *Chinchonæ*. It is probable that a climate which does not suit the latter may be friendly to the former. It yields,—

Sulphate of quinine -	-	-	-	-	-	-	-	3.93
Uncrystallized quinine -	-	-	-	-	-	-	-	2.41
Chinchonidine -	-	-	-	-	-	-	-	0.51
Chinchonine -	-	-	-	-	-	-	-	0.28
TOTAL - - -								7.13

This is evidently the sort to cultivate in Ceylon, as there can be little doubt that, by attention, the uncrystallized quinine might be brought into a condition capable of crystallization. Indeed, I have no doubt that, with a larger sample of bark, I could even now have obtained a somewhat better result. The quantity sent over for examination was, in each case, less than 1,000 grains, and consequently not sufficient for very accurate analysis.

R E T U R N.

East India (Chinchona Plant).

*Ordered, by The House of Commons, to be Printed,
18 June 1866.*

[Price 5 s. 6 d.]

353.

Under 2 lbs. 8 oz.