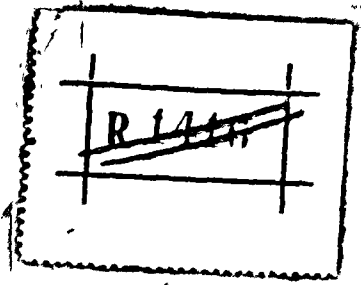


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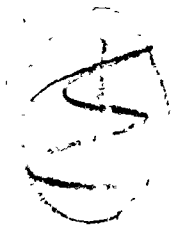
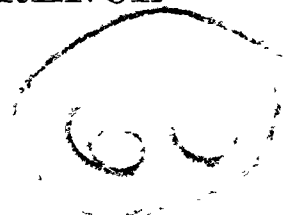
AGRICULTURAL CONFERENCE

HELD AT

BOMBAY

ON THE

5th and 6th February 1906.



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REPORT OF THE PROCEEDINGS OF
THE AGRICULTURAL CONFERENCE HELD AT BOMBAY
ON THE 5TH AND 6TH FEBRUARY 1906.

Present :

The Honourable Mr. Muir Mackenzie, C.S.I., I. C. S., M.B.A.C., Member of Council (in the chair).

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| <ol style="list-style-type: none"> 1. The Honourable Mr. C. H. Armstrong, Chairman, Bombay Chamber of Commerce. 2. Marshall Reid, Esquire, C.I.E., J.P., Representative of the Bombay Chamber of Commerce. 3. H. R. Greaves, Esquire, J.P., Representative of the Mill-owners' Association. 4. W. S. Millard, Esquire, J.P., Honorary Secretary, Natural History Society. 5. The Honourable Mr. Vithaldas Damodhar Thackersey. 6. Sardár Ráo Bahádúr Cooposwami Moodliar, Representative of the Agri-horticultural Society of Western India. 7. S. V. Desai, Esq., 8. Mugappa Saundatti, Esq., | <ol style="list-style-type: none"> 17. Ráo Bahádúr G. V. Joshi, Head Master, High School, Sátára. 18. Colonel W. F. Cahusac, of Poona. 19. Colonel J. A. Wyllie, of Belgaum. 20. Capt. J. H. Mitchell, of Násik. 21. R. Elliott, Esquire, of Mysore. 22. N. H. Pathuck, Esquire, of Bombay. 23. F. W. Tytler, Esquire, of Belgaum. 24. R. Gilbert, Esquire, of Bombay. 25. H. V. R. Kembball, Esquire, J.P., of Bombay. |
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| <ol style="list-style-type: none"> 9. Leslie Rogers, Esquire, Secretary, Bombay Chamber of Commerce. 10. C. J. Michael, Esquire, Assistant Secretary, Mill-owners' Association. 11. L. C. H. Young, Esquire, Representative of the Natural History Society. 12. Ráo Bahádúr Y. P. Mirikar, Jáhágirdár, of Ahmednagar. 13. D. E. Wacha, Esquire, J.P., of Bombay. 14. Narayandas Purshotamdas, Esquire, J.P., of Bombay. 15. The Honourable Khán Bahádúr Darasha Chichgar, of Bombay. 16. R. P. Karandikar, Esquire, of Sátára. | <ol style="list-style-type: none"> 26. H. S. Lawrence, Esquire, I. C. S., Director of Agriculture. 27. Frederick Fletcher, Esquire, M.A., B.Sc., Deputy Director of Agriculture. 28. G. A. Gammie, Esquire, F.L.S., Economic Botanist. 29. J. B. Knight, Esquire, M.Sc., Professor of Agriculture. 30. A. A. Meggitt, Esquire, B.Sc., Agricultural Chemist. 31. H. M. Lefroy, Esquire, M.A., F.E.Z., F.Z.S., Entomologist to the Government of India. 32. Colonel J. W. A. Morgan, M.R.C.V.S., Inspector General, Civil Veterinary Department. 33. J. McNeill, Esquire, I. C. S., Registrar of Co-operative Credit Societies. 34. W. A. Talbot, Esquire, F.L.S., Conservator of Forests, Central Circle. 35. G. M. Ryan, Esquire, F.L.S., Deputy Conservator of Forests, Poona. |
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Officials.

The Chairman opened the Conference with the following address :—

Gentlemen,—It is my pleasant duty, on behalf of the Department of Agriculture of this Presidency, to offer you a cordial welcome to this meeting. It is a most gratifying sign of the interest that is taken in the work of our Department that the invitation has been accepted by so many of the leading merchants of the City of Bombay. In particular, our acknowledgments are due to the Chamber of Commerce, the Mill-owners' Association, and other important public bodies who have sent their representatives and to those representatives of the Agricultural Associations of Nadiád and Dhárwár, and private

hand-holders from the districts of Ahmednagar, Poona, Ahmedabad, Sátára, Belgaum and Násik, who have undertaken such distant journeys. I do not propose to detain you long. The time of the business-men-whom I see here is money—my own time is, if not money, highly paid by the public, and I hope we are here less for talk than for business. But I should like to express the extreme pleasure and honour which it is to me to meet you and the gratification which the Government feel in having this opportunity of getting into close touch with the leaders of commerce and industry in connection with agriculture which is, and notwithstanding the developments we hope to see in the other directions must long remain, the principal and fundamental industry of this country. Gentlemen, important beginnings have been made in the development of agricultural research and education. Many of us deplore that we are still in the early stage. But I think it is agreed that we have made a fair start, and before we go further I should like to recall to you two names, and one important circumstance, to which are largely, if not wholly, due the amount of progress which we have made. The first name I have to mention to you is that of Mr. E. C. Ozanne, C.S.I., now alas! gone over to the majority. I think it may be truly affirmed that it was Mr. Ozanne who gave the first effective impetus to the scientific development of agriculture in the West of India. It was Mr. Ozanne who established the Kirkee Demonstration Farm and Dairy, and I think induced our University to contribute the invaluable stimulus of an Agricultural Diploma, afterwards converted into a Degree, for which men were educated at the College of Science. Mr. Ozanne's Dairy has, as you know, developed into an industry which has spread all over India. He had to work in unfavourable times—times in which it was placed on record in high places that expenditure on agricultural experiment was a sinful waste of public money. How incredible it seems now that any thoughtful administrator could have been responsible for such an outrageous proposition. The reason, however, is not far to seek. In those days there was no money—and the tightness of money begot suspicion of expenditure which wore even the appearance of adventure or speculation. Mr. Ozanne had to get rid of inefficient men and to bring in the efficient. And he it was who was instrumental in procuring the services of the gentleman whose name is the second that I desire to mention. I mean Mr. J. Mollison, now, I rejoice to say, Inspector-General of Agriculture. Mr. Mollison's extraordinary combination of inexhaustible energy, mobility, and industry, of practical hard commonsense with scientific acquirement, and sympathetic imagination, of enterprise with economy in expenditure, have been of inestimable value to agriculture in this Presidency and in India. But for his nerve and genius and knack of winning confidence, I feel pretty certain we should have been still a long way from the Pusa Imperial Institute and our own Poona College and Institute which is about to start. Mr. Mollison demonstrated the reasonableness of spending money in agricultural objects to many minds that were hard to open to conviction. The circumstance I have to mention is one to the negation of which I have already alluded—I mean the existence of money. There is no doubt that in the circumstances of 15 years ago we could not have gone ahead. The necessary funds would not have been there. It is all very well to gird at our backwardness compared with America and advanced European countries in agricultural education and research. But our poverty, and the thousand elementary necessities which have to be supplied in this vast continent, must never be forgotten in estimating what we can undertake. And here I should like to pay a humble tribute to the penetration and courage of that marvellous administrator, our late Viceroy Lord Curzon, in spending so much of the money, by making handsome grants to the Provincial Governments for expenditure on education and agricultural development. Gentlemen, I believe that His Excellency, who was not indisposed to criticise Bombay Administration in other matters, considered that it occupied a leading place in these two. Perhaps, so far as agriculture is concerned, that may have been a reason why he made us a particularly handsome grant. Mr. Lawrence will presently tell you how it is being spent. And here I take the opportunity to urge that my Native friends should in the Press, and in their public utterances, freely indicate their approval of this class of expenditure. I need not dwell on the fact that, whatever doubts may be entertained by members of the Native public on the desirability of certain

classes of expenditure—for instance military expenditure—they cannot but approve of liberal expenditure on agricultural objects. I hope they will express that approval and demonstrate to the controlling authorities that in asking for money for these objects we have the country behind us. Gentlemen, I should like now to refer to one or two matters in the agenda, and one or two not included in them, which will be of interest to the Conference. First I wish to say what satisfaction it gives me that one of our officers, Mr. Keatinge, is spending his furlough in pursuing a course of scientific and practical agriculture at home. Mr. Ozanne was the first man to do this, I was the second, and *longo intervallo* Mr. Keatinge is the third. To our having done so I attribute principally the continuous and persistent, and I trust well informed and intelligent, interest that we have taken in matters connected with agriculture. The development of such an interest is the principal benefit resulting from the pursuit of such a course. We do not expect that by a course of study at an agricultural college we shall make a man into a scientific and practical farmer. What we rely on it to do is to give an agricultural bent to his mind, and ability to think correctly about agriculture and to bring to bear upon agricultural problems in this country the information which he has acquired. I trust that we shall have a regular succession of officers trained in the same way as Mr. Ozanne, Mr. Keatinge and myself. In the second place I should like to remind you of the recent wise and liberal decision of the Government of India to separate the appointment of the Director of Agriculture from that of the Director of Land Records. I think that all of you who know my friend, Mr. H. S. Lawrence, will agree that he has accomplished a most creditable amount of work in the agricultural line. For my own part I consider his achievements little short of astonishing when it is remembered that he had the onerous duties connected with Land Records and Registration to perform as well. Now that we have his energies employed solely on agriculture we may expect then more rapid and solid progress. In the third place I should like to allude to the promise which is to be hoped from the results attained with Egyptian cotton in Sind. As you will see from the papers, we have this year an estimated crop of 1,000 bales and expect next year 4,000 bales. There is already a solid result. We are justified in entertaining some confidence that the establishment of that valuable product in Sind will be an accomplished fact and will prove a substantial addition to the agricultural resources of the country. If this confidence is realised we may regard the result as the second landmark in the achievements of the Department. The first was that which I have already mentioned to you—the establishment of the dairy industry. For the work done in Sind we owe acknowledgments to Mr. Mackenzie, Deputy Commissioner of Thar and Parkar, for suggestions and experiments which, it would perhaps be not too much to say, started us on the track which we have followed up with gratifying success; to our Deputy Director, Mr. Fletcher, to whose invaluable Egyptian experience, rapid appreciation of the conditions, enthusiasm, and untiring energy, that success is principally due; and to Mr. Chatfield, the Colonisation Officer, who administers the tract under the Jámrao Canal, and with Mr. Mackenzie helped by selecting zamindárs to whom seed was distributed, and in many other ways too numerous to mention. I should like now to allude to the communication from the Chamber of Commerce which is on our agenda paper and in which we are asked to establish in our forests plantations for the development of rubber and other useful plants. At present all I am able to say is that I can see no sort of objection to the starting of an experimental plantation under the superintendence of the Forest Department which can most suitably undertake the required operations. Our Agricultural Department, I think, is fully employed, and must continue to be so for some time in other direction. Of the success of the experiments in the cultivation of most of the plants mentioned by the Chamber of Commerce I am not at present very sanguine. It seems to me that there is an insuperable climatic disadvantage. We have even in the southern portions of our Canarese forest long intervals of perfectly dry weather, whereas in the localities in which para rubber for instance has flourished there seems to be generally rain more or less all the year round; however, I have no sort of objection to try experiments which I imagine, under the Forest Department, will be neither very difficult nor very expensive. There is, however, one point in the Chamber's

letter which I think I ought to notice. They seem to think that these enterprises ought preferably to be undertaken by Government. That Government should at least make experiments I cordially agree, but I think that private enterprise ought to enlist its energies in the large scale operations required; and I gather from what I have read elsewhere that sufficient data have been accumulated to make it safe for private individuals to start in advance of experiments. Only the other day I was informed of some Ceylon planters who are throwing up their tea concerns and migrating to Malay or the Straits Settlements to try their hands at rubber plantation. If there is really half the promise which the Chamber anticipate in their communication I cannot see why people should not try for themselves a venture in the Kánara District and apply to Government for a suitable concession. I am sure they will be given every assistance by the Forest Department. There are many other topics on which I might speak but I will not take up your time. I shall have other opportunities of ventilating my opinions if necessary in the course of discussions which we are about to initiate. I propose the following method of proceeding. Mr. Lawrence will follow me with a brief statement regarding the work of the Department on which he presides. We shall then take each question and suggestion, or a set of questions and suggestions on the programme. I shall then invite a discussion upon them, and at the close of the discussion I shall request that any member of the meeting who so desires will move a resolution. When we have gone through the programme I shall invite members to move any additional resolutions or make any additional suggestions that they may desire, and I shall ask Mr. Lawrence to compile a report of the proceedings of the Conference and submit it with his comments for the consideration of Government, who, you may be sure, gentlemen, will do everything in their power to carry into effect the suggestions made so far as they may be practicable and our financial resources permit. Before I close I should like to warn the Conference that owing to famine our funds this year are low and we may have to go rather more slowly than last year; but the great result has been achieved that the principle of liberal expenditure upon agricultural objects has been admitted and established. Interruptions may take place owing to the occurrence of untoward circumstances, but the principle remains. You may be assured that the consequent policy will be continuous and energetic.

Mr. H. S. Lawrence, I. C. S., Director of Agriculture, made the following statement:—

A number of questions and suggestions have been put forward by members of the Conference. Most of these will be replied to in order; but it will perhaps save valuable time if I make a general statement which will cover much of the ground opened by different enquiries. The chief points that I have to bring to your notice are the want of a trained staff, and the impossibility of remedying this defect for several years to come. We are making good progress to this end but scientific agriculture is a most technical and difficult art. A six months' course on a Government farm will not convert a Graduate of Arts into a practical farmer; we must catch our men young, put them through three years' study at the College of Agriculture, and train them for a couple of years at the farms, before we can trust them with independent experimental work and rely on the reported results. The progress that has been made in the last five years may to some extent be gauged by the following figures:—

In 1901 we had one qualified superior officer, Mr. Pestonji Mehta. We now have four European officers and one Native.

In 1901 there were three farms—at Poona, Mánjri and Surat—with two trained subordinates there employed.

We have now 9 established stations and two more on which preliminary work has just been begun. These are:—In the Deccan—Kirkee, Mánjri, Lanouli, Ganeshkhind and Dhulia; in the Southern Marátha Country—Dhárwár; in Gujarát—Surat and Nadiád; in Sind—Mirpurkhás; and the stations in course of preparation are at Dohad in the Panch Maháls and at Bassein in the Konkan.

The Native staff employed consists of two Inspectors, 10 Superintendents and 8 clerks on the farms, 7 officers attached to the superior officers for field

and research work excluding clerical duties, and 7 probationers in training—in all 34.

The financial figures may perhaps be also of interest. In 1901 we spent on the superior staff roughly Rs. 7,000, and in the current year we shall spend Rs. 38,000. On the subordinate Native staff in 1901 we spent Rs. 5,000, and in the current year Rs. 28,000.

The gross and net expenditure on the maintenance of the farms in 1901 were respectively Rs. 29,000 and Rs. 17,000, and in the current year are expected to be Rs. 77,000 and Rs. 57,000. Capital expenditure on the construction of buildings and equipment of farms was in 1901 Rs. 21,000, while in the current year it is expected to be Rs. 1 $\frac{3}{4}$ lakhs. I have excluded from these figures all veterinary expenditure. But since the cattle of the cultivator play a most important part in agricultural economy I may note that the number of veterinary dispensaries has increased in the same period from 19 to 24, that the expenditure thereon has increased from Rs. 38,000 to Rs. 53,000, that the Parel College which supplies us with veterinary assistants is being entirely renovated in the course of this and next year at a cost of nearly 3 lakhs of rupees, and that whereas in 1901 there were 46 students at this College there are at the present time 86. Inclusive of veterinary expenditure the budget of the Department has risen—thanks chiefly to the grants from the Government of India expressly allotted for this purpose—from one lakh of rupees to over 6 lakhs.

A scheme is under consideration for the establishment of numerous veterinary dispensaries in every district and the employment of a staff many times more numerous than that now existing.

As regards the provision of a trained agricultural staff we are similarly at the beginning of a great expansion. Five years ago the number of students studying at the Agricultural College was 14; today it is 113.

Government have decided to establish a special Agricultural College with a full staff of European and Native professors, and for some years the greater part of our resources must be devoted towards the construction and equipment of this College which will also be an institute for agricultural research. We have already 3 European professors for Agriculture, Chemistry and Botany, and three Native assistants for Agriculture, Entomology and Zoology. Posts have been sanctioned of an European Mycologist and an Entomologist, which will be filled when men are available. Native assistants in each of these sciences will also be provided when suitable men are available.

In each of the two last years 50 students joined the College, and we anticipate before long a full complement of 200 students. When the necessary time has elapsed to enable these men to take the degree in agriculture and to undergo a further training on the farms we shall be in a position to extend very largely the operations of the Department.

For the present our staff suffices only for the efficient management of the increased number of farms we now possess and for the beginnings of special research work in regard to the important crops of cotton and wheat and for occasional demonstrations on a small scale on the lands of private land-holders in the neighbourhood of the established farms. These introductory remarks supply some of the information which has been asked for and bring us to some of the definite suggestions which have been made.

The first suggestion is that there should be a superior school of agriculture in each of the five divisions of the Presidency, and in support of this suggestion Mr. Joshi points to the previous existence of agricultural classes at high schools. Those classes were abandoned as a complete failure, and even if the measure were desirable we have not the staff to establish these schools. But I do not think it is desirable that boys should specialise in a particular subject at so early a stage of their education. On the other hand, the Central College is likely to be the most efficient institution for the instruction of the principles of agriculture to students from every part of the Presidency, and the application of those principles can be further studied on the farms that

now exist in every separate agricultural division. Several gentlemen have asked for the extension of demonstration farms. In the course of the last two years seven new farms have been established, and each one of these has a portion set apart for demonstration in addition to the area on which experiments are being conducted. Every distinct agricultural tract is now provided with a farm, and though I am anxious to see several more established as men and money become available, yet it is now or will shortly be possible for all cultivators in the Presidency to visit a farm and see on it cultivation conducted in the climatic conditions which affect their own fields. Special efforts have been made to induce neighbouring cultivators to visit the established farms, and have been fairly successful, and the Superintendents have been sent on tour to many villages in the adjoining tracts with good results. I will give one recent instance.

The sugarcane now standing at Manjri is a remarkable object-lesson in the value of the application of a top-dressing of oilcake fertiliser. Mr. Kelkar toured along the Mutha and Nira Canals and addressed meetings of the chief villagers. He invited 200 men to visit the farm, and these came with 200 others, and the experiments were most keenly observed and criticised by 400 of the best cultivators holding lands along these canals. This visit was so successful that arrangements are being made to invite cultivators from the Krishna Canal in the south of Sâtára to pay a similar visit.

It is impossible to cover the country with a large number of demonstration plots without a trained staff many times more numerous than we possess, and since it is easier and almost as effective to bring the cultivators to the farm we are adopting this latter plan. Another useful method of demonstration is the application of the desired improvement to crops actually cultivated by private holders, and this form of demonstration has been practised on a considerable scale—in regard to the distribution of improved or selected seed. For instance in Sind some 1,500 acres have been cultivated with Egyptian cotton by Sindhi zamindárs whose cultivation has been throughout supervised and assisted by Mr. Fletcher and a special staff. So also the superior varieties of jowári grown on our Khândesh and Dhárwár farms have been received with great keenness by neighbouring rayats. Sets of sugarcane have been sent from Poona to localities as distant as Karáchi and Umarkot; and selected cotton seed was distributed to 11,000 acres in Dhárwár and Ahmedabad. As regards the establishment of experimental farms in each of the Konkan districts the want of a trained staff is the first absolute bar; and there are many more urgent wants in the tracts of precarious rainfall where irrigational projects are being newly introduced. The establishment of District Agricultural Associations is strongly urged, and I entirely agree with these gentlemen as to the importance of the active co-operation of such associations. This co-operation, however, can only be maintained by a keen local interest in the movement, or by the constant stimulus of the advice of itinerant expert officers. For the latter work we have not yet the necessary staff. I had hoped, however, that in Poona and Sâtára the interest was sufficiently keen to make the movement successful without an excessive degree of official support. It is an easy matter to enrol a number of gentlemen in Agricultural Associations, but experience has shown the difficulty of maintaining them in a vigorous and successful existence, and the danger that their premature establishment and disappearance may block the way to their subsequent creation in more favourable conditions. For these reasons I am not disposed to ask Collectors to enrol Agricultural Associations for their districts unless firstly an effective desire for co-operation is shown by land-holders of position; secondly, a Government farm is within easy reach where the members can study improvements in cultivation; and thirdly, some official agency is available for inspecting their lands and giving them advice. These conditions are, I think, sufficiently fulfilled in the cases of Poona and Sâtára. The appointment of Itinerating Inspectors is the next point. A beginning has been made by the appointment of Mr. Mahli in Sind and Mr. Kelkar in the Deccan, but for the extension of this work we must wait for several years.

We are also asked to send the produce of Government farms to fairs and shows for exhibition. This also predicates the existence of a staff capable of

explaining the exhibits. We have adopted this measure in some instances, *e. g.*, at the Agricultural Exhibition in Bombay in January last, and at the horse and cattle shows at Ahmednagar in November; and we fully recognize the value of the suggestion.

As regards the publication of information I must refer you to Chapter V of the report which was submitted for your perusal.

The *Chairman* then invited a discussion of Mr. Lawrence's statement; but no remarks being offered, proceeded to a consideration of the detailed questions and suggestions which with provisional replies had been printed and circulated to the members of the Conference.

(1) Adulteration in Gujarat Cotton.

The *Honourable Mr. Vithaldas D. Thackersey* asked whether Government were aware of the adulteration taking place in Gujarát cotton (Khándesh and Surat) owing to the greater facilities of transit.

The *Chairman* said that the matter was under the consideration of Government, but the meeting would no doubt be glad to hear the views of members on the question, and he would ask Mr. Thackersey to explain his views.

The *Honourable Mr. Vithaldas D. Thackersey*.—The main necessity at present is for the distribution of superior qualities of seed to cultivators. Mr. Mehta was appointed last year to do this work. On one hand we try to see that each district grows the best quality of cotton that it can produce. The action of Government is confined to this. Instead of trying to grow Broach in Khándesh or Khándesh in Broach they try to grow best Khándesh in Khándesh and best Surat in Surat. This work is frustrated by the people bringing in for their own benefit and against the interest of the whole community the cotton seeds of one district into another district; for instance, we see that Khándesh cotton is brought into -Surat District and there ginned along with Surat kapás and mixed up, and in that way bales are sent out to Bombay as Surat cotton. Of course, when such adulteration takes place in the ginning factories, and if it is not on a very large scale, the merchants in the name of Surat give greater prices. What is the effect of this adulteration? The seed purchased from the ginning factories are mixed with Khándesh. On one hand Government try to distribute best seeds in the locality and on the other hand merchants mix up and try to fill the cultivators' hands with mixed varieties. If cotton is mixed up in districts growing superior variety I cannot understand that this mixing is for anything else but for private benefit. The result is that the name of the place loses its value, and I see that many places which used to obtain the best rate in the market have lost their good names. It is for this reason that it is necessary to prevent kapás going from one district into another district—for instance, kapás going from Karanja to Bársi. I hope in the beginning that Government with a large staff at its command will ascertain the extent of this adulteration, and then will take some steps to prevent this fraudulent adulteration.

Mr. *Fletcher* said, as far as he could obtain information, the amount of mixing was not so much in ginning as in pressing. Khándesh was not brought down to Surat and ginned there. He did not think there was any mixture in the cultivation of different varieties.

Mr. *D. E. Wacha* said dealers of Khándesh cotton mixed with Surat in order to earn a larger price. Buyers were thus made to pay a higher price for particular classes of cotton. He further observed that they did not obtain the cotton of the quality they used to receive some five years ago from Bársi and Surat. This adulteration was sure to endanger the cotton industry of Bombay. Attention of the Legislature should be drawn to this.

Mr. *Narayandas Purshotamdas* said that Kaira cotton was imported into the Broach District, and that it should not be included in the Customs and Chamber's lists as Broach cotton. Attention was required to that point. This lessened the value of pure Broach cotton and thereby rayáts were losers. He further observed that there was no adulteration of seed in the Surat District. It has preserved its originality and the crops produced were of excellent quality. Of course, there might have been some adulteration in the presses by merchants,

but the seed was all the Surat seed. The cotton produced this season near Balsár and Amalsád and on this side of the Tápti was certainly of very best quality.

Mr. Ravji B. Patel remarked that many Kaira cultivators imported Broach seed and the so-called Kaira cotton was the produce of Broach seed.

Mr. Lawrence.—As regards the inclusion of Kaira cotton under Broach cotton in the returns published by the Chamber of Commerce, the classification of the Bombay cottons as reported in the cotton forecast reports of the Agricultural Department was made in consultation with the Chamber of Commerce. In these reports only cotton from certain areas of Kaira is shown under the Broach variety. If the Chamber of Commerce or the Mill-owners' Association desire to have the classification again modified the matter will be fully considered on a formal representation from either body.

The Chairman said, if the Chamber of Commerce or any other public body would place their views in regard to the adulteration of cotton before Government they would be glad to investigate the matter thoroughly.

(2) Egyptian Cotton in Sind.

The Honourable Mr. Vithaldas D. Thackersey asked:—What steps Government propose to take to bring Indo-Egyptian cotton in Sind to Bombay next season and to make it known to the users of this cotton in order that the zamindárs may obtain the full value of such cotton?

Mr. Lawrence stated, this year this cotton was grown on about 1,500 acres and it is estimated that a thousand bales have been produced.

Samples of this cotton have been valued in Bombay at Rs. 325 to Rs. 375 per khandi. The local middlemen who had had no experience of such cotton were unwilling to touch it, and Messrs. Ralli Brothers who have agencies established throughout the tract in which the cotton was grown undertook to purchase it from the zamindárs. The existence of this cotton was made known to several mill-owners who expressed a desire to purchase it, but I have no information available whether they succeeded in doing so or not. Next year the cotton will be grown on an area of some 6,000 acres and some 4,000 bales may be expected. It may be hoped that the production of so large a crop will attract buyers into the local market from Bombay, Karáchi and Ahmedabad firms. The cotton is all in the neighbourhood of Mirpurkhás, a flourishing market town on the Sind-Rájputána Railway, but it is in no sense the property of Government, and it is not in my opinion advisable that Government should undertake the purely commercial work of disposing of the crop. Every facility will be given by Government agency to enable purchasers to get into communication with the producers, but the movement and disposal of the crop should, I think, be left in the hands of the trade.

The Honourable Mr. C. H. Armstrong read the following letter, which he had received that morning:—

“I have read the report of the Agricultural Department, and in my opinion the most interesting part is the information referring to the cultivation of Egyptian cotton in Sind. ■, as expected in the course of a few years, a quantity of something like 100,000 bales of Egyptian cotton can be produced, this will be a matter of great importance for a certain section of cotton mills. However, in all other respects it does not appear that the Agricultural Department has made great progress in improving the quality of the indigenous growths of cotton. Numerous experiments have been made in hybrids of cotton, and, as you know, our Cotton Association has given valuations of such experimental growths on various occasions, but as far as I can judge this has not led to much practical progress hitherto. According to my idea, what we want more than anything else is the improvement of the staple in the indigenous growths and which must be obtained by the most simple and natural means, and what ultimately will prove to be the most effective method. For this respect I would like to make the following suggestions:—Take for an example the Berár and Central Provinces. Twenty years ago the cotton from the Khangaum, Akola, and Karanja Districts was much superior in staple than what is now coming from these districts. Every year it will be the case that in certain

part of the country the crop has grown and matured under more favourable circumstances than in other parts. The Agricultural Department should gather information in which talukás or villages the crops were brought to maturity under particularly favourable circumstances, and I think it is a correct conclusion that these crops will also yield the best quality of seed. Therefore from these favoured parts of the country as much seed as possible or required should be secured for the purpose of distributing seed for the planting of the next crop. We have now certain varieties of Oomras, known as Basseim, Zalna, Sailoo and Parbhani which are much better in staple than the general run of cotton from the Berár and Central Provinces, but the supply of these superior qualities is very limited and prices accordingly very high. If the staple of the crops generally could be improved by a careful selection of superior sound seed and say if instead of 100,000 bales in future 500,000 bales could be produced equal in staple and the varieties above mentioned, this would indeed be a substantial improvement."

Lancashire, added Mr. Armstrong, did not care much for Indian cotton. Two years ago a larger amount than usual was shipped to Lancashire, but when the Lancashire spinners found that they could get American cotton at the prices which they wished to pay, a large quantity of Surat cotton was re-shipped to the Continent to be used there. If they could improve the staple of the cotton in this part of India, and if the Continent could be assured of a steady supply of a really good growth, he thought they could be quite sure that the Continent would take a very large increased supply from India. The result would be that, instead of the Continent competing with Lancashire for American cotton, Lancashire would find less competition on the Continent and would be able to buy American cotton at lower rates than at present.

The Chairman expressed the opinion that experience showed that the cultivator obtained more remuneration out of the shorter staple cotton. The belief most generally expressed in the reports which had come to them was that, given a market for the better variety, the cultivator would resume the growth of it. He did not think that their information was that the cultivator was altogether ignorant of the virtues of the selection of seed. In the only place where he had been able to make a personal investigation, namely, in certain parts of Sind, he found that the cultivators were very largely in the habit of selecting their seeds very carefully. He personally inclined to the belief that, given a good market, given the alteration of certain trades practices, that the cultivator was very likely to improve for himself the cotton which they required, and give them a longer staple. Government had done a great deal in the distribution of seed, and they were prepared, with a certain amount of caution, to go forward in the same direction. Government, however, could not become a universal seed-distributing agency. They would recognize that the question of finance made this impracticable. All Government could hope to do was to put in a little leaven which they hoped would leaven the whole lump.

Mr. Narayandas Purshotamdas enquired as to the acre rate of yield of Egyptian cotton in Sind.

Mr. Fletcher replied that the picking of Egyptian cotton had been only begun in Sind, and he was unable to state the exact acre rate; but he hoped that the yield would come to about 1,200 lbs. of seed cotton or about 400 lbs. of lint per acre. In giving information regarding the cross-fertilization of cotton he said that the process of hybridization was very slow. Some hybrids showed an increase of 16 per cent. in value over Broach.

Mr. D. E. Wacha asked if there was any truth in the complaint that irrigated crops suffered as sufficient quantity of water could not be obtained at reasonable rates. He further remarked that it was understood that Government with a view to induce cultivators to undertake irrigated cultivation charged low rates in the beginning but when the area had sufficiently been extended the rates were raised.

The Chairman stated that the Jámrao Canal was the only canal on which cotton could be grown in Sind on such an enormous scale. The rates had been fixed without reference to the value of the crops and would continue for several years to come. He thought there was no chance of their being raised, until the cotton had made a very fair start. He assured them that there would never be

any fear of the cultivation of the Egyptian cotton being checked by the irrigational rates. The tremendous expansion that was taking place on the canal cultivation showed that the people were not deterred by the rates which were exceedingly moderate.

(3) Introduction of American Cotton Boll Weevil into India.

The Honourable Mr. Vithaldas D. Thackersey asked:—Has the attention of Government been directed to the danger of the introduction of the American cotton boll weevil into India and is there any information available on the subject in particular in regard to possible precautions?

Mr. Lawrence stated:—*Mr. Lefroy*, the Entomologist to the Government of India, is present, and will explain the character of the pest and the precautions possible. I will only add that the matter has attracted attention and is under the consideration of Government.

Mr. Lefroy stated that it had been estimated that the damage done to the cotton crop in the United States by the pest came to about 50 per cent. He also found from an official report that if the American cotton seed was imported there was nothing whatever to prevent the pest being carried to a long distance on board ship.

The Honourable Mr. Vithaldas said in view of the information given to them by *Mr. Lefroy* it was necessary that the Government should take some steps by which this danger of introducing the pest could be minimised. He thought the hands of the Agricultural Department must be strengthened by legislative or some other measures. As this was a very important question he would move a resolution that the Conference was of opinion that the Government should take such steps as they might consider necessary to minimise the danger of the introduction of American cotton boll weevil into India.

Mr. D. E. Wacha seconded the resolution.

Mr. Lawrence said the subject had been considered by the Egyptian Government who last year issued a proclamation prohibiting the importation of American seed altogether.

The Chairman said it seemed to him that the contingency which *Mr. Vithaldas* wished them to consider was somewhat remote. He did not know if there was any likelihood of anything like an extensive trial being given to the American cotton. If any contingency of that kind, however, arose in future the desirability of taking the steps suggested by *Mr. Vithaldas* ought to be considered.

Mr. Fletcher said he had introduced a variety of American cotton seeds some time ago after careful fumigation and disinfection.

Mr. Millard suggested that the question of disinfection be extended to all kinds of seeds imported into this country.

The Chairman said he did not wish it to be understood by what he had said that the Government was against the resolution and explained that no officer of Government was entitled to vote on any resolution at this Conference.

Mr. Karandikar was of opinion that no case had been made out for the resolution proposed by *Mr. Vithaldas*.

The Honourable Mr. Vithaldas D. Thackersey explained that he was not urging immediate legislation but he simply desired to bring the matter to the notice of Government so that it might be enquired into and the necessary steps taken.

Mr. Vithaldas amended his resolution by adding the words "and all other diseases" after the words "cotton boll weevil."

The resolution was carried *nom. con.*

(4) Indigenous Cotton.

Mr. D. E. Wacha asked:—What are the proposals for the improvement and extension of cotton cultivation in India? Assuming that the proposals are adopted is there any reasonable possibility of a larger production per acre than is to be obtained at present? Is there any reliable estimate of the present production per acre?

How far may it be practical to send to Egypt a few intelligent Sind cultivators in order to learn there the Egyptian method of cotton cultivation in a practical manner?

Cannot the indigenous cotton of Multán be cultivated and improved? Some samples imported last year and used prove the staple to be eminently suitable for cotton mills.

Mr. Fletcher, replying to Mr. Wacha's questions said:—It will suffice here to sketch the progress that has been made in this Presidency since that made in other parts of India does not fall within the province of this Department. It may, however, be stated that seed of various kinds has been distributed in large quantities to other Presidencies. In addition I have initiated a survey of the cottons of the whole of India from the commercial and agricultural points of view similar to that which has been recently done by Professor Gammie from the botanical point of view. Further, since the variety of cotton grown in Khándesh is identical botanically with that grown over the greater parts of the Punjáb, United Provinces and Central Provinces, any improvement brought about in the former will apply automatically to the latter districts. The subject may be divided under the following heads:—

- (a) Introduction of Egyptian cotton.
- (b) Improvement of the staple of indigenous cottons.
- (c) Improvement of the methods of cultivation.
- (d) Trials of tree cottons.
- (e) Extension of the cultivation of cotton.

(a) *Introduction of Egyptian cotton.*—This Department in 1904 obtained a crop of this kind of cotton on some 20 acres at Dhoro Náro. The results of this trial seemed to justify the distribution of seed to zamindárs, and in consequence with the assistance of Mr. Chatfield, Colonization Officer, Jámrao Canals, some 1,500 acres were sown in the year 1905. The results of this was very satisfactory notwithstanding the extraordinarily unfavourable season, the average yield on good average land being about 1,000 lbs. seed cotton per acre. As the seed sown in 1905 was of several kinds, steps have been taken to dispose of it out of the country, and 50 tons of Abassi (white) seed have been obtained and distributed during the present year, this variety having on the whole shown superiority over the other Egyptian varieties for growth under the conditions in Sind. This year therefore some 7,000 acres of white Egyptian are being grown.

If its cultivation is carefully watched and fostered by this Department there seems to be no reason why it should not take permanent root in Sind.

(b) *Improvement of the Staple of indigenous varieties.*—The work of hybridization and selection continues, but the failure of the past few monsoons has made progress comparatively slow. Further, the work on all the farms was initiated not more than two years ago and on one (Dhulia) only last year. This work is being actively carried on on the farms at Surat, Dhárwár, Dhulia and Nadiád. The only hybrids that are of more than two years' creation are growing on the Surat Farm, the object in view being to improve the already valuable Surati-Broach growth. Many of these hybrids have now become fixed, and one, viz., 1027A, has for the last two seasons been valued commercially at as much as 20 per cent. above the produce of ordinary Surati-Broach seed. This hybrid alone is, I consider, worth much more than has been spent on the farm since its establishment. It is only a matter of time for the progeny of this hybrid to spread over the whole of the area now growing the Surati-Broach variety. Both parents of the hybrid are indigenous and there appears therefore to be no reason why the superiority of the hybrid should not easily be maintained. This hybrid is given here merely as an example of a real improvement in staple that has been brought about within the last 3 seasons. Still, further improvement may be expected in this particular hybrid as the result of further treatment by this Department.

On the Dhárwár and Dhulia and Nadiád Farms the breeding of hybrids has not progressed as far as that at Surat, owing to its very recent inception.

There is no reason for thinking that the progress should be less rapid on these farms. On the contrary from the character of the cottons grown in these districts it would appear that even more speedy improvement is not improbable.

(c) *Improvements in methods of cultivation.*—Owing to recent failures of the monsoon absolute proof of improvement in the methods of the Presidency Proper has been impossible. Indications have, however, been obtained that the yield of both American and indigenous cotton can be very largely increased in the Southern Marátha Country by the use of improved methods.

(d) *Trials of tree cottons.*—I have made what I consider now to be a complete collection of the tree cottons of the world. Experiments are in progress with the best of these on a scale which will prove after at most two normal monsoons whether or not plantations of such cottons in the Presidency Proper can be made a commercial success. Two at least of these tree varieties yield cotton which is valued commercially at about the same price as Egyptian.

(e) *Extension of the cultivation of cotton.*—The actual area annually under cotton in this Presidency (excluding Native States but including Siúd) is 3,700,000 acres, the total annual area cultivated in cotton growing tracts with all crops being 12,000,000 acres. This means that on an average cotton is grown all over the Presidency once in about 3 years. Cotton cannot profitably be grown oftener than this and therefore the extension of its cultivation in this Presidency can only be effected through an extension of the total area annually cultivated with all crops. For this there seems to be under present conditions very little immediate prospect.

(5) Rubber and Camphor Products.

Mr. Marshall Reid, referring to the letter from the Chamber of Commerce, said that he did not think that the Bombay Chamber of Commerce was likely to agree with the views expressed by the Chairman in regard to forest exploitation. He thought that Government could undertake profitable experiments at a comparatively small cost in regard to rubber and camphor, and unless Government would help in the matter nothing could be done.

Mr. D. E. Wacha observed that it was the duty of Government to develop the economic resources of the country. The taxpayer's money was paid into the treasury and it should be expended on agricultural matters.

Mr. Karandikar said that the results of the experiments should be published.

The Chairman, in order to clear any wrong impression which might have been created, stated that Government was entirely ready to conduct experiments. He only suggested the possibility of private enterprise, and he was very glad to promise that every endeavour should be made to conduct experiments on the lines indicated by the Conference. (Applause.)

Mr. Marshall Reid remarked that he should like to propose a resolution on the matter. He had some little difficulty as to what form the resolution should take, because two departments seemed to be concerned—agriculture and forest. With the Chairman's permission he should like to bring forward a resolution on the following day.

(6) Rubber and Aleurite moluccana.

Colonel Wyllie drew attention to the suitability of Belgaum to the extended cultivation of *Castilloa elastica* (for its rubber) and of *Aleurites moluccana* (for its oil).

(7) Calotropis.

Mr. Ryan suggested the offer of a reward for a machine that would successfully extract fibre from stems of *Calotropis procera* and *Calotropis gigantea*.

(8) Agaves.

Mr. Ryan suggested that the cultivation of *Agave sisalana* should be extended, specially in the treeless tracts of the Dekkan forests. He further suggested that failing the extension of *Agave sisalana* the cultivation of *Agave vivipara* should be undertaken.

Mr. Gammie stated that experiments on the cultivation of the Agave were being carried out at the Ganeshkhind Botanical Gardens and invited attention to the results recorded in the Annual Report of the last year.

(9) Chaff-cutters.

Mr. McNeill suggested the consideration of a cheaper supply of chaff-cutters. He stated that a demand had sprung up in the Dhárwár District for these implements since the exhibition of their use on the Dhárwár farm. The present price of imported chaff-cutters was Rs. 10 or Rs. 11 and the Dhárwár Association were anxious to learn whether they could not be supplied at a cheaper rate by indigenous manufacture.

(10) Agricultural Improvements.

Mr. Wacha asked: Is it the case that agricultural products grown in experimental farms in one locality and proved to be successful become equally successful when attempted to be grown in another soil? It is important to know this as the success in one locality may not necessarily mean success in another.

Mr. Lawrence stated: The view that success in one locality may not necessarily mean success in another is undoubtedly correct.

(11) Prickly pear.

The Bombay Chamber of Commerce suggested that Government might send round experienced native subordinates to demonstrate the use of the prickly pear (*Opuntia Dillenii*) as fodder. Mr. Knight gave the following reply:—

The statement given in the letter of the Chamber of Commerce is not in accordance with the experiments on our farms which were conducted by Mr. P. R. Mehta in 1902 at Poona and Surat. The results are published in Bulletin No. 22 of the Department of Agriculture. At Poona five animals were fed on this substance for 5 months. The animals for the first few days absolutely refused to touch it, but after two or three days they commenced to eat it. At times they consumed as much as 25 lbs. per head. The material was prepared by boiling and roasting and the thorns were removed by pincers. During the first month the animals maintained the normal condition of flesh fairly well, but after the first month they failed rapidly until at the close of the test they were in an extremely emaciated condition and would have died if they had not been given proper food immediately, but they rapidly regained their strength and flesh when given good food. During most of the treatment they suffered from diarrhoea.

In the experiments referred to by the letter of the Chamber of Commerce I think the experimental period could not have been of any great length.

We may say that the results of the Bombay experiments prove that the prickly pear has scarcely any value as a cattle food. This is further borne out by Dr. Leather's analysis of the substance. He gave it as containing about one per cent. of protein, while ordinary grass contains about $2\frac{1}{2}$ times this amount.

A plant breeder in California, U. S. A., claims to have originated a spineless variety of *Opuntia* which might be slightly more useful if it could replace the present prickly variety, as it grows under the same condition, but I am of opinion that it would gradually acquire the thorns if grown here, for, if it did not, it would not be able to grow on account of goats, etc.

(12) Cassava.

The Bombay Chamber of Commerce suggested that selected varieties of Cassava (*Manihot utilissima*) suitable to the climate of Southern India might be introduced from South America.

Mr. Knight explained the experiments made at Mánjri.

Cassava according to De Candolle is a native of South America, and probably of Brazil. It is cultivated in many places in South America, Central

America, Mexico, the West Indies and to a limited extent in the Gulf States of the United States of America. In India it is cultivated in Assam, Burma, parts of Northern Bengal and in Madras. It has been referred to as a drought-resisting plant. On account of the large fleshy tubers, it no doubt can resist drought to a considerable extent, but some time during the year it requires plenty of watering and would not succeed without such a supply of moisture.

There are two classes commonly spoken of as bitter and sweet Cassava, the bitter being poisonous, but Dr. Leather has found poison in both varieties when grown in Poona. Experiments with this plant have been going on at Poona since October 1901, at which time several varieties were received from Mr. Robert Thompson of Jamaica. These all grew very well. Indian varieties have been added to them from time to time, till now we have a total of 54 varieties to experiment with, obtained as follows:—15 varieties from the West Indies, 28 from Trivandrum, 4 from Darjeeling and Northern Bengal, 3 from Nagpur, Central Provinces, one from Madras and 3 from Malabar. As only a small tuber was received in each case, it has taken several years to get a sufficient quantity to experiment on. But in 1904-05 we were able to get at the outturn from five of the West Indian varieties which run from six to ten tons per acre, furnishing from 2,500 to 3,100 lbs. of starch, but we have not yet enough of the Indian varieties to estimate the outturn. The starch was extracted from 25 lbs. of tubers of each of 30 varieties. The percentage of starch was found to vary from 13 to 25 per cent. This crop has been grown in Mánjri under irrigation and good cultural conditions. It is not probable that anything like the above results would be obtained under dry cultivation or by careless methods.

There are many things that we have yet to ascertain before we are ready to place this crop in the cultivator's hands, such as the poisonous qualities, drought-resisting properties, best time for planting, best time for harvesting and methods of preparing food from it, to be safe from its poisonous effects.

These experiments will be undertaken and when the investigations are complete the results will be published. Measures may then be taken for the introduction of the cultivation of Cassava if it is thought desirable.

The following literature may be referred to:—

Agricultural Ledger, 1897, No. 4.

Watt's Economic Products, Vol. V, page 157.

Annual Report, Experimental Farm, Bombay Presidency, for 1902, page 4, paragraph 16.

Annual Report, Experimental Farm, Bombay Presidency, for 1903, page 13, paragraph 37.

Annual Report, Experimental Farm, Bombay Presidency, for 1904, page 70, paragraph 28.

Annual Report, Experimental Farm, Bombay Presidency, for 1905, page 73, paragraphs 38 and 39.

(13) Nitro-culture.

The Bombay Chamber of Commerce suggested that experiments in inoculating soil with nitrogen-fixing bacteria should be undertaken on a large scale in this country with the ordinary pulses.

Mr. Fletcher said: I have tried several of the cultures prepared by and obtained direct from the United States Department of Agriculture. The results so far have been negative. This has been the case also in all experiments in Europe and America, except where trial has been made on land which has never previously grown any leguminous crop whatever. A conclusive trial can, however, only be made when special cultures for the various Indian crops have been prepared in India. It is only in this way that the statement of the United States Department can be tested that improved varieties of bacteria can be bred; at present the results of all experiments in this direction have been negative, whether carried out in India, Europe or America.

(14) Questions on behalf of the Natural History Society.

The Hon. Secretary, *Mr. Millard* said: In submitting the following questions I should like to offer my congratulations to the Director of Agriculture for [the Bombay Presidency and to the Department for the excellent report which has been issued for the year 1904-05. It is full of information which plainly shows that great progress has been made to bring the Department more into line with those of other countries, and if the programme which has been laid down is carried out with as much expedition as is possible the Bombay Presidency will be equipped with an Agricultural Department which will be second to none in India.

This advance is due to the enlightened view taken by the Government of India in granting Rs. 20 lakhs annually for Agricultural Department, out of which the Bombay Presidency has fortunately secured Rs. 3½ lakhs. It is stated that this share is excessive, but I venture to doubt whether there are many in this Presidency who will agree with that view, especially when one considers how for many years Bombay has been in the van of advancement of agriculture and has only been kept back by want of funds due to famine and other troubles. The Department is, I think, to be congratulated in being more in touch now with commerce than it was previously, and it is gratifying to know that suggestions are welcome whenever they are submitted. We in Bombay City are greatly pleased at the decision to start a Botanical Garden below gháts, and although Bassein is not perhaps quite as accessible to Bombay as might be desired, it is a distinct acquisition and we trust that the feeling which exists here, the necessity that Bombay should possess—what all other large cities have—a Government Botanical Garden, will not be forgotten or absorbed in the term “Economical Botanical Garden.” It is well known that scientific work and research cannot be carried on satisfactorily in this Presidency without a properly equipped Botanical Garden, and it will be remembered that the first proposal submitted in the memorial to Government in September 1903 for the “Improvement of Agriculture and Horticulture of the Bombay Presidency,” and which was signed by so many influential people representing all classes of the community in this Presidency, was that “Two fully equipped botanical gardens should be established, one at Poona and one near Bombay, the former as the centre of study and investigation for the Deccan, and the latter for the Konkán and Gujarát. Each garden should be provided with a herbarium and with chemical and botanical laboratories, and to each should be attached a farm for agricultural and horticultural experiments.” My Committee hope that this proposal will be carried out in full since it has their unqualified approval.

(1) *Mr. Millard* asked: Why is no mention made in the report for the year 1904-05 of the amounts which it is anticipated Financial provision. the programme will absorb? Will the Department state the sums which it is proposed to devote to each point of the programme?

Mr. Lawrence invited attention to paragraph 3 of the Annual Report, in which it was stated that the initial capital expenditure would be about Rs. 14 lakhs and ultimate recurring expenditure about Rs. 6½ lakhs. The details of the programme have not been finally settled.

In regard to the Bassein garden in which *Mr. Millard* is specially interested it is proposed to spend Rs. 12,000 in the current year and Rs. 10,000 in the coming year.

(2) *Mr. Millard* asked: What work is the Agricultural Chemist employed on at present, and when is it proposed to commence Work of Agricultural Chemist. analyses of the different soils of the Presidency to ascertain what constituents are lacking and what manures would be advisable to supply these deficiencies?

Mr. Lawrence replied that the Agricultural Chemist had been working in a temporary laboratory. His principal immediate duty was to teach agricultural Chemistry to 113 boys. In about 6 months' time he would be able to begin analytical work.

(3) *Mr. Millard* asked: Is it not advisable to suggest to Government the desirability of prohibiting the export of bones from India, since they contain so much phosphates of lime—a most valuable manure for soils liable to exhaustion?

Bone manure.

The Chairman explained that bones were of limited value as a manure unless cheap supplies of sulphuric acid were available to manufacture superphosphates. It was therefore profitable to export bones until sulphuric acid was manufactured in large quantities in the country.

(4) *Mr. Millard* asked: What progress has been made with the proposed Botanical Garden at Bassein up to now and is it anticipated that the ground will be cleared of all jungle growth before the next rains commence?

Bassein Garden.

Mr. Lawrence replied: We were placed in possession of the garden a few days ago, and the work of clearance will be pressed on with expedition.

(5) *Mr. Millard* asked: In view of the great boom in rubber is it not desirable to start an experimental garden at once in Kánara, where the climatic conditions are so similar to those of the districts in Ceylon and Assam where rubber is growing so satisfactorily? Is it not also desirable that the Director of Agriculture should visit Ceylon to ascertain these conditions and other information in connection with rubber cultivation, etc.?

Rubber.

Mr. Lawrence replied: Rubber plantations are to be undertaken by the Forest Department.

(6) *Mr. Millard* asked: Has the experiment been tried in this Presidency of local demonstration by taking over a certain amount of land from the ryot—guaranteeing him an average crop—and then showing him by the result what improved and scientific cultivation will do? This experiment has apparently been successful in the Central Provinces.

Agricultural demonstration.

demon-

Mr. Lawrence replied: We recognize the benefit of this kind of work and have already taken it up on a small scale, but we have not at present the skilled staff necessary for a large development. In the Central Provinces the conditions are somewhat different. Over large tracts there the local cultivation is exceedingly backward and it is possible to send out as a Departmental representative an ordinary uneducated cultivator of the Kunbi caste for the sake of demonstrating such simple improvements as sowing by drill, straight furrowing and inter-cultivation. In this Presidency, in the greater part of which cultivation is most skilful, these practices are already well-known and a much higher class of demonstration is necessary to improve on the local practices.

(7) *Mr. Millard* asked: Why is there only such a brief reference to “special experiments”? No results are of course expected from such experiments for several years, but a little more information might have been volunteered as to the extent of such experiments in such important products as manioc (*sic*), indigo, camphor, rubber. *Hevea braziliensis* and *Castilloa elastica* might succeed better in the damper climate below gháts.

Special experiments.

Mr. Lawrence replied: Attention is invited to the Appendix to the Report. This Appendix is only an index to the detailed account of these experiments, which will be found in the Report which is separately published of experimental farms.

(8) *Mr. Millard* asked: Would it not be feasible to obtain a scientifically trained pomologist to carry out the experiments of improving fruit and fruitculture?

Pomology.

Mr. Lawrence replied that it was not probable that a pomologist would be entertained for Bombay. A pomologist is about to be attached to the Imperial staff of the Government of India, but it has been decided that he should restrict his investigations to the Himalayan tracts.

(15) Plantations in Ka'nara.

Mr. Marshall Reid moved that Government be requested to establish one or more plantations in the Kánara District under the control of the Forest Department for experimentation with products especially suited to forest areas. *Mr. Reid* said he had suggested that the plantation should be under the control of the Forest Department, because such a plantation as he proposed required close and constant supervision. He was very much impressed by a suggestion made that a senior officer of the Agricultural Department—either one or more—should be sent to other countries to see how the seeds could be grown successfully. He also proposed that the Forest Department should be asked to make a report on the experiments.

Mr. Millard seconded the resolution.

The Chairman said all that he could say with regard to this subject was that the Government would be very glad to consider the resolution. The Forest Department was very much occupied with its work, and in no part of the Presidency was this more so than in the southern circle, and particularly in the Kánara District.

The resolution was carried *nem. con.*

Mr. Elliot advocated the establishment of school gardens and the entertainment of peripatetic Agricultural Inspectors, the institution of depôts of seeds and manures at Taluka and District Head-quarters, and distribution of leaflets of instructions.

(16) Tree Cotton.

Sirdar Cooposwami Mudliar enquired whether the cotton grown by *Mr. Tytler* at Belgaum is Caravonica and can be grown in Poona.

Mr. Lawrence replied this cotton is not Caravonica and is being grown on the Poona Farms in order to ascertain its suitability to Poona conditions.

Mr. Tytler exhibited the samples of tree cotton grown by him.

(17) Cultivation of Groundnut.

The Bombay Chamber of Commerce and Dhárwár Agricultural Association recommend the distribution through Government agency of groundnut.

Mr. Fletcher, in reply, stated: The results of previous experiments appear to prove that though foreign varieties are little, if any, more resistant to disease than the local variety, yet they are more prolific and seem to a certain extent to be looked upon with favour by cultivators to whom they were distributed in previous years, *viz.*, 1901-02 and 1902-03. The varieties that seem most promising in this respect are large Japanese, Spanish peanut and Pondicherry.

(18) Abandonment of Grape cultivation near Poona.

Sirdar Cooposwami Mudliar enquired the cause of the abandonment of grape cultivation near Poona.

Mr. Gammie replied that the cause of the abandonment of grape cultivation was due to the prevalence of two diseases—mildew and anthracnosis. Under the direction of the Cryptogamic Botanist to the Government of India during the last two years remedies had been applied to the vineries in the Empress Gardens. The results had been encouraging, and he hoped during the present year to publish their experiences. They were also experimenting with the introduction of new varieties in the hope that they might prove disease-resisting and these would also be reported on at intervals.

(19) Potato Disease.

The Dhárwár Agricultural Association and *Sirdar Cooposwami Mudliar* suggested that potato seed should be imported and distributed through Government agency and that the Imperial Cryptogamic Botanist be deputed to study the diseases of potato.

Mr. Lawrence stated: The only remedy known for potato disease is the continuous importation of fresh sound seed and this remedy is already thoroughly

well understood by the cultivators at Maháleshwar and in the Poona District, where the greater part of the potatoes grown in Western India come from. Since the importation of this potato seed is a well established trade in Bombay, where the seed merchants draw their supplies both from Italy and Saharanpur for this purpose, it does not appear to be desirable that Government should enter into competition with the trade, but both at Dhárwar and at Poona our farms are attempting to find potatoes suitable to the locality, and when we have done so we will recommend native growers to ask for this variety from the merchants and the merchants to obtain supplies of this variety from Europe.

Sirdar Coopooswami Mudliar suggested that the Agricultural Department should devise some means to protect the farmers who undertook experimental cultivation from loss until the sale of the crop under experiment became established in the market.

Mr. Lawrence stated: This question is one of great difficulty. Suggestions are invited from the commercial members of the Conference.

No suggestions were offered.

(20) Locust parasite.

Colonel Wyllie invited attention to the discovery of a locust-destroying parasite reported in a Portuguese journal called *Broteria*.

Mr. Lefroy said it was impossible in the present state of things to make any use of the parasite.

(21) Tobacco Cultivation and Curing.

The Nadiad Agricultural Association suggested that a curing house for tobacco may be built on the Government Farm and a subordinate be sent to America to study the cultivation of tobacco.

Mr. Lawrence stated: A curing house is about to be built. At the present stage it is not advisable to send a native subordinate to America for this purpose.

The Government of India intend to appoint a special tobacco expert and measures will then be taken under his advice.

Mr. D. E. Wacha referred to the experiments conducted at Nadiad some years ago by private land-holders.

Mr. Lawrence explained that the advice of *Sirdar Rao Bahadur Béchardas Viharidas* and the other gentlemen who had conducted those experiments had been obtained by the Agricultural Department and they would be consulted throughout the operations.

(22) Sugarcane.

Mr. Wacha asked: Is the fact of oilcakes serving as an admirable manure for the cultivation of sugarcane widely brought to public notice?

Mr. Lawrence stated: The value of oilcakes as manure for sugarcane has been published in the Departmental Bulletins and been brought to the notice of vernacular newspapers which have a wide circulation. It has also been the subject of a lecture to the agriculturists who attended the Bombay Exhibition in January 1905, and has been communicated to sugarcane cultivators along the canals by an Agricultural Inspector specially deputed for the purpose.

Mr. Wacha asked: Can a small colony of sugar cultivators in Java be brought down here to show our ryots a better system of cultivating the sugarcane plant? Or may it not be useful to send a few from Bombay Presidency to study the method in vogue in that island which is now so vigorously competing with Mauritius in the Indian sugar trade.

Mr. Lawrence stated: Sugarcane cultivation in the Deccan is already very good; the outturn of the best cultivation near Poona rivals that obtained in the Mauritius, and it is improbable that any benefit would be derived from the measure suggested.

The Chairman added: The methods adopted in Mauritius have received an exhaustive trial at Poona and it has been found that they are not in any degree superior to the indigenous system.

(23) Methods of Manufacturing Sugar.

Mr. Karandikar suggested that the process of extraction of sugar from sugarcane adopted in the United Provinces should be followed in Bombay and that an experiment should be made in regard to clarifying rab by means of alkaline obtained from plantain ashes.

Mr. Knight replied: I visited Benares Exhibition in January, and was present when Mr. Hadi, Assistant Director of Agriculture, United Provinces, demonstrated the making of sugar by his process. I was very much pleased with its working. The main features are:—More careful boiling by a series of pans which receive different amounts of heat at different stages of the evaporation; the clarification of the juice by means of a mucilaginous extract from the Bhandi plant (*Hibiscus esculantus*); setting of the rab (a thick syrup) in earthen pots for crystallization; the extraction of the crystal by a centrifugal machine and final purification by washing with a solution of bicarbonate of soda and boiled soap nuts. The resulting sugar is nearly white and fully equal in colour to sugar made by the sugar refiners of Behar which I also visited recently. The sugar from Mr. Hadi's process has slight molasses taste and is a little more moist than the factory sugar, still it appeared quite good enough for the Indian market. I can see no reason why this system of producing sugar is not suitable for the Bombay side. It requires perhaps somewhat more skill than to produce good *gul* and the initial outlay, Rs. 800, for the apparatus is quite a little higher. It is by far the simplest method of making white sugar that I am acquainted with. The use of charcoal from any source is not necessary to produce sugar of a whiteness suitable for the Indian market and the refinement by means of charcoal would be only necessary in order to produce the very highest grades of granulated sugar and the practice has, I believe, been entirely discarded in the newer refineries. But for all that I have said in favour of Hadi's method I can see no reason at present for its trial on the farms of this presidency or its introduction among the cultivators here, because the manufacture of *gul* is more remunerative than that of white sugar. A ton of *gul* can be obtained from 8 to 10 tons of cane, but to produce white sugar the factories of Behar use over 13 tons of cane or 44 per cent. more cane. The average price for the last 3 years of *gul* has been Rs. 7-8-0 per maund, while that of sugar has been Rs. 9-11-0 per maund or only 29 per cent. higher. We see then that we should require 44 per cent. more of cane for a ton of sugar but receive only 29 per cent. more in price. Unfortunately I cannot tell you the comparative cost of manufacture by each method, but certainly here also the figures would be in favour of *gul* manufacture. A study of the imports and exports of the presidency reveals the fact that the imports of *gul* and other raw sugar exceed the exports by nearly 500,000 maunds; if the average be taken at 87·5 maunds per acre, it would require nearly 6,000 acres or an increase of about $\frac{1}{3}$ th on the present area to supply our own market; and further than this I am informed that large quantities of the poorer grades of Java and other brown sugars are mixed with black *guls* received from other provinces which would, if it could be estimated, show a still higher consumption of *gul* as such. So taking all things together according to my idea Bombay cultivators of cane should for the present aim to produce *gul* to supply the home market instead of thinking of making sugar for export. Improvements should rather be in searching for better methods of crushing and boiling in order to produce a higher quality of *gul*.

Mr. D. E. Wacha said that it was very necessary to encourage sugarcane cultivation. In Germany every attempt was made to extract sugar from beetroot in increasing quantity. Similar attempts should be made here to extract sugar from sugarcane. The Agricultural Department should take up this question. He had no experience of agricultural matters, but he could say that sugarcane brought into bazar were not so large and thick as they were when he was a boy.

Mr. Marshall Reid referred to the law of demand and supply and said that so long as the price of sugarcane was low, the cultivators would not be induced to cultivate sugarcane on a sufficiently large scale.

Mr. Narayandas Purshotamdas called the attention of the Conference to the fact that an experiment was made some time ago to produce sugar from toddy.

The Chairman said the experiment proved a great failure. Similar experiments were made at Madras, but their results did not encourage them to start the experiments again in Bombay.

(24) Native Specialists in Agriculture.

Mr. D. E. Wacha asked: What facilities and opportunities are contemplated by the Government to rear a class of native specialists in agriculture? What may be the obstacles in the way? How may they be removed with the view to attain the object?

Mr. Lawrence stated: Men will be taught agriculture in the new College which is being established at Poona. They will be able to specialise subsequently in particular subjects by a post graduate course at Pusa and to study practical work on the Government Farms.

Mr. Wacha said there was a great dearth of scientific agricultural talent in the native community and it was the duty of Government to develop that talent. He was glad to see that the Government realised the importance of the question.

(25) Practical Instruction in Agriculture.

Mr. Narayandas Purshotamdas suggested that arrangements be made to give instruction in practical agriculture.

Mr. Lawrence explained that such arrangements already existed for the Agricultural Students of the College of Science, Poona. Object lesson plots were reserved on the Poona Farm for these students who were taught to handle all implements and perform every function required by the actual cultivator. When the new Agricultural College was opened these facilities would be further increased. There would be a farm of 60 acres attached to the College solely for the purpose of practical demonstration and instruction. There are also other farms and gardens within easy reach of the present institution—the Poona farm for fodder growing and dairying; the Manjri farm for sugarcane and other local crops; and the Ganeshkhind Gardens as a Botanical Research station. The Empress Gardens were also available for the study of fruit-culture and floriculture.

Mr. Narayandas expressed gratification at this explanation.

(26) Central Agricultural Association.

Mr. D. E. Wacha asked: Is it practicable to promote a Central Agricultural Association having for its object the supply of selected seeds and cheap manure to the ryots, in the same way that the Egyptian Agricultural Society does in co-operation with the National Bank of Egypt?

Mr. Lawrence: The conditions are somewhat different in Egypt from those that we have to deal with here. The Egyptian Agricultural Society deals with very large land-holders—members of the Khedivial families and Pashas—and does not, it is believed, attempt to reach the small cultivator.

The establishment of a Central Agricultural Association is not however a new or untried experiment. Gentlemen here present are no doubt aware that a society entitled the Agri-Horticultural Society of Western India, whose object was proudly announced to be "the promotion of agriculture and horticulture in all its branches," has had a chequered career for nearly three-fourths of a century; at times it had been very active, for instance, when Dr. Buist and Dr. Giraud were the Secretaries between 1840 and 1850; at times moribund and bankrupt, and once it ceased to exist for 10 years. It was re-established in 1881 by His Excellency Sir James Fergusson and for the last 25 years it has done good work in a quiet way in experiments with fruit cultivation and the diffusion of plants from the Empress Gardens which Government have entrusted to their care.

I understand that a similar society is again being started in Bombay. Such associations, however, in my opinion are most useful when they co-ordinate the work of branch-associations in the District, and I am inclined to think that it would be a mistake to establish a Central Association until some organization has grown up through which it can be kept in touch with agricultural work in the country districts.

Mr. Wacha referring to Lord Cromer's report, said that there was no difference between Indian and Egyptian ryots and the writers of the report were fully acquainted with the condition of Indian ryots. In fact they had passed a large number of years of their life in the Indian Administration.

In support of his reply *Mr. Lawrence* referred to a note on the Central Agricultural Committee of Madras in the issue of the 2nd February of the *Times of India*, which contained the following :—“The great difficulty now experienced is the want of trained men to fill the posts of agricultural inspectors and instructors, and several Associations have expressed the opinion that no improvement is possible without the immediate employment of some trained inspectors.”

(27) A Central Agricultural Bank.

Mr. D. E. Wacha asked : What are the obstacles in the way of establishing a bank for purposes of pure agricultural loans in a central locality in the Presidency exactly on the lines of the National Bank of Egypt, a report on the unqualified success of which is made in more than one recent report on the administration of Egypt by Lord Cromer, specially in the report for 1903 which gives a description of the condition of the Fellaheen ?

Mr. Lawrence said : This point was incidentally discussed by the Board of Agriculture of India at a conference in January 1905, and it was held that the existing system of takavi loans for purposes of agriculture was well adapted for this purpose.

The establishment of co-operative credit societies is also expected to assist this work.

Mr. Wacha, referring to the questions relating to Agricultural Associations and Agricultural banks, pointed out that Sir Edwin Palmer established agricultural banks in Egypt and by advancing Rs. 50,00,000 within a period of five years improved the condition of Egyptian ryots. He also referred to Lord Cromer's report and described what attempts had been made to ameliorate the condition of Egyptian ryots. He requested that Government should consider Lord Cromer's report and should see how far the attempts made in Egypt were feasible of introduction in India.

Mr. McNeill, Registrar of Co-operative Credit Societies, stated that the report quoted by *Mr. Wacha* showed that the loans in question were only granted to substantial land-holders. *Mr. McNeill* cited the figures of these loans from the Report.

(28) The Bombay Veterinary College.

Mr. Wacha asked : What may be the details of the proposed improvements in the Bombay Veterinary College ?

Mr. Lawrence stated : The proposed improvements consist of the construction of suitable buildings and laboratories and their equipment and the construction of quarters for students.

The present College is established on land belonging to the Society for the Prevention of Cruelty to Animals. There are no quarters for the residence of students and the existing buildings, which are lent by the Society, are not in good condition and are not thoroughly equipped. Government have purchased a property of some 8 acres adjoining the premises of the Society and are about to establish a thoroughly equipped college on their own land.

The hostels for the students will cost about Rs. 80,000 and the college building about 1½ lakhs.

(29) Dissemination of Agricultural Knowledge among Villagers.

Mr. D. E. Wacha asked: Will it not be an advantage, in view of disseminating the necessary agricultural knowledge among the villagers, to interest village school masters and doctors who are more or less in their confidence?

Mr. Lawrence stated: Measures are being taken by the Educational Department to instruct village school masters in the elements of agricultural knowledge with the hope of arousing their interest in the matter, and of enabling them to teach agricultural object lessons with intelligence.

I do not think the doctors can be utilized in this way.

At the Training Colleges at Ahmedabad, Poona, Dhárwár, Hyderabad (Sind), not only are the new school masters being taught, but all the older men are being re-called and put through a course of 6 months.

(30) Agricultural Knowledge.

Mr. Narandas Purshotandas thought that much agricultural knowledge could be disseminated by means of leaflets.

The Chairman remarked that this was a very difficult matter. The publication of leaflets sounded well, but it was difficult to get people to read them. Probably the best method to follow would be the one adopted in Sind in connection with the introduction of Egyptian cotton. When cultivators once knew that certain methods were really advantageous they would not be slow to adopt them.

(31) Curator for Economic Garden.

Mr. W. S. Millard said in paragraph 3 of the annual report of the Department it was stated that the programme provided for the appointment of eight European specialists. It might be that amongst these were included a curator for the Economic Garden in the Konkan at Bassein. The appointment of a skilled curator should be the first step in the formation of such a garden. If appointed later, work done would have to be undone. This curator should be resident. It was not possible for any man, however experienced, to efficiently supervise the formation of such a garden by periodical visits. The curator should be selected by the officer under whom he would have to work and not by the selection of the unfittest. It was urgently necessary that this curator should be appointed without delay.

Mr. Marshall Reid supported the suggestion.

(32) Cattle Farms.

Mr. Joshi asked: Is there any scheme in contemplation for the supply of stud bulls in the different districts of the Deccan?

Mr. Lawrence stated: The question of the establishment of a cattle farm at Sholapur is being reconsidered by Government. Since with the present unfavourable financial prospects it is a question of choosing between expenditure on the protection of cattle from disease by the increase of Veterinary Dispensaries and the improvement of cattle by the supply of superior stud bulls the view has been strongly urged that the first object is far the most important.

Colonel J. W. Morgan said that the question was under the consideration of the Government of India and he was not prepared to make a statement on the subject.

Mr. Marshall Reid moved the Resolution—

“That this Conference desires to impress upon the Government their view that the expenditure now being incurred on agricultural development is of a most useful character and should not be curtailed except under stress of the most urgent financial necessity.”

The Honourable Mr. Vithaldas Damodardas Thackersey seconded the resolution, which was carried.

(33) Close of the Conference.

The Chairman in closing the Conference said he did not propose to make any remarks on the different subjects that they had discussed. But he should like to express his own keen sense of the value he entertained of their views and to inform them that he would take great care that all practical suggestions would be very carefully considered by the Government and by their expert departments. He thanked them for their attendance and trusted that next year they would have a better attendance and their work would prove even more useful and valuable.

The Honourable Mr. Vithaldas, in moving a vote of thanks to the Chairman, said he had conducted the duties of the Chairman in a most able manner. They had received every facility and sympathy from him in their deliberations of the several important subjects that had come before them. He was sure he echoed the sentiments of every one present there when he said that this Conference had got an ideal Chairman. (Applause.)

The resolution was carried.

APPENDIX.

From THE CHAMBER OF COMMERCE;
 To THE DIRECTOR OF LAND RECORDS AND AGRICULTURE, BOMBAY,
 Poona.

Bombay, 19th October 1905.

Sir,

I am directed by the Committee of the Bombay Chamber of Commerce to lay before you, for the favourable consideration of Government, certain proposals for the cultivation and exploitation of the forest products of this country, a subject that can hardly be said to have hitherto received the serious attention it deserves. Owing to the generally slow growth of many of the commerce-yielding trees and the large capital necessarily required, private individuals cannot be expected to entertain enterprises of such nature; and it is therefore felt that it is the duty of the Government in a tropical country like India to assume the responsibility of providing for the Empire's present and future wants in the direction indicated. The Committee of the Chamber are of opinion that much might be attained by the establishment, under expert official control, of extensive Government plantations in suitable localities all over the country, but more especially along the West Coast, and on the hills and table lands of Southern India. A comparatively long list of plants and trees might be submitted for this purpose, but my Committee consider that plantations of a few of the most important would suffice at present to inaugurate the policy they strongly advocate regarding the commercial development of India's forest produce.

My Committee have at present given their serious attention to the two valuable products of rubber and camphor. The unprecedented use of these by European manufacturers of late demand an almost inexhaustible supply of the raw material. It is generally acknowledged that the natural sources of supply have already been over-exploited, and it is therefore believed the time has now come when these commodities might be produced on a more practical and scientific basis, as is done in the matter of tea, coffee, cinchona and other commercial products of like nature. My Committee are of opinion that all, or some at least, of the following varieties of rubber and camphor might be generally cultivated with great advantage to both the commerce and Revenue of the country:—

Indigenous Rubbers.

(1) *Ficus elastica*—vernacular *Bar*, the *Oaoutchouc* tree of Assam. Experiments have already proved that the tree grows well not only in Assam, but also in Malabar, Belgaum and other localities in Southern India, and there is every reason to believe that it would thrive as well along the lower hills of the western gháts. It is easily propagated by seed and cuttings, and also as an epiphyte in the forks of other forest trees. It has been calculated that an acre planted with *Ficus elastica* will give about four times as much revenue as an acre planted with first class timber trees, and that a rubber tree of say 50 years is equal in value to any two other forest trees of the same age.

(2) *Artocarpus integrifolia*, the common jack-fruit tree; vernacular *Katol*, *Panas* (Hindi), *Phanas* (Bombay), *Pila* (Támil). This tree is indigenous in the forest of the western gháts. If cultivated in plantations both the fruit and the rubber extract would find very remunerative markets.

(3) There are several species of *Carissa* that produce good rubber. One of these, *Carissa suavis*, is found wild as a lofty climber in many parts of the Deccan Peninsula.

(4) *Cryptostegia grandiflora* is an extensive climber growing semi-wild in western gháts and adjacent plains. It is easily propagated and is said to produce "a very firm and superior rubber."

5. India possesses 15 species of *Gutta-percha* but only 4 are actual natives of the country. Of these four the most important is *Dichopsis elliptica*, vernacular *Punchoti*, *Palu* (Bombay and Támil), *Punchouta* (Kánarese). This is a large tree extending from Bombay to Kánara and ascending to an altitude of 4,000 feet, and is also common in all the moist sholas of the western gháts, Wynaad and Travancore.

Exotic Rubber.

Of the many foreign varieties of rubber-yielding trees the four following hold out greatest promise of success in Western and Southern India:—

(1) *Castilloa elastica* from Central America.—Grows in all temperatures above 60° Fah't, and from sea level to altitudes of 1,500 feet. It is a rapid grower and an extremely hardy tree, thriving equally well in both dry and rainy regions. It is believed that many localities in the Wynaad and along the western slopes of the gháts and parts of the Konkan would admirably suit the *Castilloa*.

(2) *Para Rubber tree—Hevea brasiliensis*.—This requires an equable climate of between 80° to 95° Fah't, a moist rich soil, and not more than 80 to 100 feet above sea level. Sir Deitrich Brandis, late Director-General of Forests in India, wrote :—" We may conclude that Kánara, Malabar and Travancore offer the desired conditions as regards temperature for the successful cultivation of this caoutchouc-yielding species of *Hevea*. I would specially draw the attention of Forest Officers in this respect to the moist evergreen forest at the foot of the Koorg Gháts and in Kánara."

It has lately been found that the bulk of para rubber is mixed with the latex of *Sapium aucuparium* (the admixture it is said amounts to nearly 40%), a tree that thrives in the same soil and climate as the *Hevea brasiliensis*. It might therefore be also grown to advantage in similar localities.

(3) *The Ceara Rubber tree of Brazil, Manihot Glaziovii*.—This species thrives well in a temperature between 82° and 85° Fah't, and from sea level to an altitude of nearly 3,000 feet. It is not affected by dry arid climate, provided there are periodical rains such as our monsoons. It is the hardest of its species, and extremely adaptable to varied conditions of soil and climate. It grows well in Ceylon, and has also succeeded in Madras and over the Malabar and Wynaad Districts, and also in the vicinity of Calicut. This tree is known to thrive in Bombay itself, and a good specimen may be seen in the University Gardens. There is every reason to conclude that the western slopes of the gháts and the plains of the Konkan are admirably suited to its cultivation.

(4) *Dichopsis Gutta*.—This is a native of Malacca but can be acclimatised wherever the indigenous variety *D. elliptica* grows in India; and it is said to produce the best quality of gutta-percha.

The land area under rubber trees of all kinds in Ceylon on the 1st July 1905 is shown to be 39,140 acres.

A very large percentage of these trees are still immature and have therefore not been tapped for rubber, yet a very gratifying yield is shown in the following figures :—

1903—441,798 lbs., 1904—77,212 lbs. and 1905 approximately 91,546 lbs. Attention may here be drawn to the fact that Ceylon rubber, which was almost unknown a few years ago, now holds the premier position in the London rubber market as regards price, realising as much as 6s. to 7s. per lb.

With the Ceylon acreage we may instructively contrast the latest figures from other eastern lands, given in the report of the United Planters' Association of the Straits for 1904 :—

Malay Peninsula	...	...	...	30,000	acres
Java	...	...	...	5,000	"
India and Burma	...	...	...	5,000	"
				<u>40,000</u>	<u>acres</u>

Thus it will be observed that Ceylon by itself has an acreage equal to that of all other eastern producing countries together, and India practically comes last on the list; a position that does not reflect credit on the agricultural enterprize of the Indian Government.

Camphor.

Definite information is not available regarding previous experiments made to introduce the cultivation and manufacture of camphor into India. But that some such experiments had been undertaken is evident from the number of flourishing Chinese camphor trees that may be seen in certain parts of the country. It is therefore reasonable to suppose that instead of yearly importing over 16 lakhs of rupees worth of China and Japan camphor, India might itself be made a source of supply. There is a reason to believe that if extended experiments were made, not only could the China camphor tree be easily re-introduced, but that indigenous varieties of camphor-yielding plants might also be successfully cultivated. The following suggest themselves for trial :—

(1) *The Camphor Laurel, Cinnamomum Camphora*, which species produces the bulk of the camphor exported from China, Japan and Formosa. This tree, it appears, was first brought over to India about the year 1844 by Doctor Fortune, when he also introduced the tea plant and vegetable tallow tree from China. His experiments proved successful in the above three products in the districts of Dehra Dun and Kumaun in the Himalayas at elevations of from 2,000 to 4,000 feet above sea level. All three have since become thoroughly acclimatised, and to this day besides extensive tea plantations flourishing groves of tallow and camphor trees may be seen in the Dun. A specimen of this tree may also be seen in the Empress Gardens, Poona. There appears to be no cogent reason why large plantations of the useful China laurel should not be undertaken along the lower Himalayas and the higher reaches of the Western Gháts and plateaux of Mysore.

(2) There are many species of Blumeas, which yield camphor, and are indigenous to this country. *Blumea balsamifera* is common not only in China and Burma, but through-

out the Eastern Himalayas, ranging from 1,000 to 4,000 feet. This species produces the well-known Ngai camphor of Burma. *Blumea lacera* grows as a weed throughout the plains of India to Travancore, and ascends to 2,000 feet in the Himalayas. *Blumea eriantha* often mistaken for *Blumea lacera* is a common plant on the western coast of the Bombay Presidency and is known to the Natives at Kakronda. But the vernacular name *bhamburda* is commonly applied to all Blumeas on the Bombay side.

From the above notes it would appear that the extended cultivation and manufacture of Blumea and China laurel camphors would be highly desirable, while rubber cultivation promises even still more remunerative results. But the comparatively long time that would have to lapse before such products could successfully be placed on a commercial basis, would as stated before preclude private individuals from taking up enterprises of such magnitude. The cultivation of such forest products—at least in their initiatory stages—is therefore felt to be essentially an undertaking for Government in its Forest and Agricultural Departments. When we look at the extraordinary success of tea, coffee and cinchona plantations—all originally fostered by the Indian Government—there can be no reasonable doubt as to the beneficial effects that would follow similar official experiments in these other commodities now recommended as peculiarly suitable to the climatic and other favourable conditions prevailing in India.

Other Country Products.

My Committee also desire to take this opportunity of drawing the attention of Government to the following additional products which in their opinion might be systematically exploited to the advantage of Western and Southern India:—

(a) *Cassava*, *Manihot utilissima*, which produces the well-known tapioca of commerce. Originally a native of South America it has long since been acclimatised in India, and is largely cultivated in the south and also in Assam and Bengal. It grows in almost any soil and requires very little cultivation. It is pre-eminently a drought-resisting crop, requiring only about 15 inches of rain for perfect development. It would therefore be successfully grown in famine years when there was a deficiency in the rainfall. It is suggested that Government might offer some substantial inducements to Native growers, and also establish independent plantations of their own for purposes of demonstrations. Here selected varieties, suitable to the climate of Southern India, might be introduced from South America.

(b) *Prickly-pear*, *Opuntia Dillenii*, vernacular *Ndg Phun*. An excellent fodder for cattle, experiments having proved that cattle will readily devour it if the thorns are extracted and it is chopped up into small pieces. As it grows wild in great profusion all over Southern India, it would be invaluable in saving cattle in times of famine. It is suggested that Government might send round experienced Native subordinates to demonstrate the use of the prickly-pear to villagers in every district.

(c) *Gum*.—There are numerous kinds in India, whose commercial value is undoubted, but it is here desired to specially recommend one variety for further exploitation, *viz.*, the Jingan gum, a product of the Jingan tree, *Odina wodier*. A large deciduous tree 40 or 50 feet in height, met with throughout the hotter parts of India. This gum possesses about $\frac{3}{4}$ of the viscosity of gum arabic and has been very favourably reported on in the London market. The bark is used in parts of India for tanning and as a dye, and a decoction made from it together with the gum is used medicinally.

(d) *Nitro-culture*.—Experiments in inoculating soil with nitrogen-fixing bacteria have proved so successful in America in the case of leguminous crops, that it is considered advisable that similar experiments should be undertaken on a large scale in this country with such pulses as *math* (*Phaseolus aconitifolius*), *mung* or *urid* (*Phaseolus mungo-gram*), or chick pea (*Cicer arietinum*) *dal* or cadjan pea (*Cajanus indicus*) and *muttar* or field pea (*Pisum arvense*).

(e) *Fruit culture and preservation*.—There is a vast field open for the improvement of all kinds of Indian fruit. The reduction or entire elimination of seed offers openings for various experiments in this direction. A comparatively seedless mango for example would be much appreciated. The recently discovered method of preserving fruit in vacuum tins leads itself to transportation of fruit throughout India as well as to foreign markets.

(f) And lastly it is believed that vanilla, cardamums, nutmegs, pepper and cloves would all thrive in this part of the country. Vanilla, for instance, is proved to grow well in Bombay. Plants bearing beans may be seen both in the Victoria Gardens and on Malabar Hill. These it is suggested might be tried in the experimental gardens previously advocated in the Konkan and along the Western Ghats.

In conclusion, my Committee would be obliged by your communicating to them the results of any successful agricultural experiments that may be available from time to time, as they would be very pleased to disseminate all such information among the commercial community of this Presidency.

I have, etc.,

(Signed) J. B. LESLIE ROGERS,
Secretary.

Notes on the Suggestions by the Chamber of Commerce of Bombay.

The establishment of an experimental plantation in Kánara under the control either of the Forest Department or the Agricultural Department is under the consideration of Government.

2. In regard to the several trees and crops mentioned by the Committee, the following information supplied by the Conservators of the Forest Department and Professor Gammie may be of interest.

3. *Ficus elastica*.—(Mr. Murray.) Is not indigenous in the Presidency. It thrives very well in the rich soil of the Belgaum Fort, and might possibly succeed below the gháts in Kánara as it requires a heavy rainfall and moist atmosphere.

(Mr. Gleadow.) This I regard as the most promising. The tree grows freely in Bombay (though it is distinctly an exotic and not a Bombay forest product) and could be planted with success on a considerable scale in places not liable to hot dry winds. It is probable that the yield of rubber would be satisfactory, but this, the crux of the whole matter, cannot be foretold with certainty. On this side of India the district of Kánara most resembles its true habitat. The inferiority of most Bombay forests for this tree lies in the long hot weather and absence of the other monsoon. There is some information on rubber experiments scattered in the pages of the *Indian Forester*.

(Mr. Gammie.) This tree thrives well in the Konkan and also in the Deccan within reach of irrigation. An analysis made for me some time ago by Mr. D. Hooper proves that the rubber prepared from a tree growing in the Empress Garden, Poona, is of excellent quality. This species would succeed admirably under natural conditions in the forests of North Kánara. It reproduces itself readily from cuttings, but the trees should be grown in sheltered situations as their branches are very brittle.

4. *Artocarpus integrifolia*.—(Mr. Murray.) *A. integrifolia* grows abundantly in many of the evergreen forests of Sirsi and Siddápur. But before commencing plantations it would be as well to ascertain the commercial value of the latex from trees already existing.

(Mr. Gleadow.) I doubt if it would be worth while growing this for the fruit, and I never heard of its rubber being used except for birdlime.

(Mr. Gammie.) I expect an analysis of the rubber extracted from this, but am not sanguine as to the result.

5. *Carissa*.—(Mr. Gleadow.) I am not aware of any likely to be useful.

(Mr. Gammie.) I have been unsuccessful so far in the extraction of rubber from species of this genus. By selection, however, a very useful fruit may be produced.

6. *Cryptostegia grandiflora*.—(Mr. Murray.) Might possibly be introduced, though I should imagine the cultivation of a giant climber would be a matter of some difficulty.

(Mr. Gammie.) Thrives everywhere both on good and bad soils and it stands drought well. It produces a rubber which is reported on as being of excellent quality. I have sent a sample to the Imperial Institute for a commercial report. I have supplied numerous applicants with seeds during the past year.

7. *Gutta-percha*. (Mr. Gammie.) Could be profitably exploited only in North Kánara I think.

8. *Castilloa elastica*.—(Mr. Gammie.) Seems to thrive only in deep, easily worked soil. Therefore the greater part of the Presidency offers unsuitable conditions. I would suggest its trial in the Municipal Garden at Surat, if the authorities in charge do not object.

9. *Para*. (*Hevea brasiliensis*).—(Mr. Murray.) Is I should imagine not suited to Kánara. The climate is not sufficiently equable. In the cold weather the temperature falls below 60° in the only parts where the conditions are otherwise suitable, that is, in the valleys between the spurs of the gháts at the foot of the range.

(Mr. Gammie.) Should be tried in North Kánara; seedlings do not survive the winter's cold of the Deccan.

10. *Ceara rubber* (*Manihot Glaziovii*).—(Mr. Murray.) The particular species which is at present so much in request in Ceylon is, I believe, the Ceara, and in all probability this would be the one most suited to the conditions of Kánara. The Ceylon rubber, I know, grows on varying altitudes down to almost the sea level and might probably be cultivated with advantage on many of the slopes in the Bhatkal Petha of the Honávar Táluka, which were formerly extensively kumried and are now covered with a very inferior evergreen scrub.

(Mr. Gammie.) Thrives admirably in the Deccan and is extremely tolerant of drought. Its growth is very rapid and rubber would probably be yielded in paying quantities in the third year. This plant is not suitable for a rainy climate. Years ago I found that it refused to produce rubber in the Eastern Himalayas.

11. *Dickopsis Gutta*.—(Mr. Gammie.) Being a tree of equatorial forest will not probably succeed in the Bombay Presidency. It will save much labour and expense if people refrain from attempting the introduction of equatorial plants, because as a general rule they cannot withstand extreme change of temperature.

12. *Camphor* (*Cinnamomum camphora*).—(Mr. Murray.) There is good reason to believe that some of the species would thrive on the uplands of Kánara and the neighbouring portions of Belgaum and Dhárwár.

(Mr. Gleadow.) Is flourishing round Dehra. I have planted it myself without difficulty. It contains a considerable quantity of camphor, but no regular experiments have been made in this country so far as I know on the methods of extraction from leaves or wood. Here I should not be inclined to try it on the upper gháts but on good soils in the sheltered valleys or plains below.

(Mr. Gammie.) The camphor laurel adapts itself to most climates and there is no reason why it should not be grown largely.

13. *Blumea* spp.—(Mr. Gleadow.) Natives do not seem to value or use these and they are rather farm than forest produce.

(Mr. Gammie.) Need not be cultivated as there must be enormous quantities growing naturally on the gháts.

14. *Cassava* (*Manihot utilisima*).—Experiments made at Mánjri will be explained by Mr. Knight.

15. *Prickly-pear* (*Opuntia Dillenii*).—Experiments made at Mánjri will be explained by Mr. Knight.

16. *Gum* (*Odina Wodier*).—(Mr. Gleadow.) In some parts of the country this tree is distorted with the effects of tapping. It is very common throughout this (Northern) Circle. The gum is cheap because it is collected by people who have nothing else to do, and I very much doubt whether the produce of regular plantations would bear the cost of supervision and labour.

(Mr. Gammie.) *Odina Wodier* and other trees should be worked out by the Forest Department.

17. *Nitro-culture* will be explained by Mr. Fletcher.

18. *Fruit culture*.—(Mr. Gammie.) I have already attempted something in this line by the introduction of many sorts of fruits of the citrus family, apples, peaches, plums, etc., which have proved successful in the United Provinces. By careful search and enquiry we shall probably find many fruits suitable for growth in the Bombay Presidency.

19. *Vanilla, Cardamoms, Nutmegs, Pepper, Cloves*.—(Mr. Gammie.) Vanilla may succeed in the Konkan. I cannot set fruits at Poona. Nutmegs and cloves are equatorial and may not succeed. Pepper and cardamoms are already grown in North Kánara.

PROCEEDINGS

OF THE

AGRICULTURAL CONFERENCE

~~1915~~

1915

HELD AT

AHMEDABAD

ON THE

2

26th and 27th November 1907.



BOMBAY

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1908

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REPORT ON THE PROCEEDINGS OF THE AGRICULTURAL
 CONFERENCE HELD AT AHMEDABAD ON THE
 26TH AND 27TH NOVEMBER 1907.

Present :

- The Honourable Mr. J. W. P. Muir Mackenzie, O.S.I., I. C. S., M.R.A.C.,
 Member of Council (in the chair).
- The Honourable Mr. J. O. Miller, C.S.I., I. C. S., Member of Council in charge Revenue and Agricultural Department, Government of India. (Visitor.)
- J. DeC. Atkins, Esquire, B.A., I. C. S., Commissioner, Northern Division. (Visitor.)
- T. J. Ward, Esq., { Representatives of the Chamber of
 A. Leslie, Esq., { Commerce, Bombay.
- W. S. Millard, Esquire. (Representative of the Bombay Natural History Society, Bombay.)
- Sirdar Ráo Bahádur K. V. Mudliar. (Representative of the Agri-Horticultural Society of Western India, Poona.)
- Narandás Purshottamdás, Esquire, J. P. (Representative of the Mill Owners' Association, Bombay.)
- Khán Bahádur Dárásháh Ruttonji Chichgar, Bombay.
- Ráo Bahádur Keshavlál Hirálál, Chairman, Ahmedabad Municipality.
- Shet Chinubháí Mádhavlál, C.I.E., Ahmedabad.
- Shet Mansukhbháí Bhagubháí, Ahmedabad.
- Shet Mangaldás G. Parekh, Ahmedabad.
- Shet Lálbhái Dalpathháí, Ahmedabad.
- Shet Manibháí Jaisingbhái Hatesing, Ahmedabad.
- Shet Dalpathbhái M. Hatesing, Ahmedabad.
- Shet Mohanlálbhái M. Hatesing, Ahmedabad.
- Munshi Mehejoddin Fakiroddin, Ahmedabad.
- Lálshankar Hariprasád, Esquire. (Representative of the Bombay Grain Merchants' Association, Bombay.)
- Ráo Bahádur Purshottamdás Viháridás Desai, Esquire, { Representatives of the Nadiád
 Girdhardás Mangaldás, Esquire, { Agricultural Association, Nadiád.
- Ambáshankar Uttam-rám Malji, Esq., { Representa-
 Trimbaklál Bhaváni- shankar, Esquire, { tives of the Broach Dis-
 trict Asso-
 ciation,
 Broach.
- Vyankatesh Shrinivás Náik, Esquire. (Representative of Dhárwár Agricultural Association, Dhárwár.)
- Dámodar Keshav Parashrámi, Esquire (Representative of Agricultural Association, Sangamner.)
- Ambálál Khandubháí Desai, Esquire, { Repre s e n t-
 Chhotalál Dhirajráam, Esquire, { atives of
 Gulábbháí Bhagvánji K h e d u t
 Patel, Esquire, { Association,
 Dayábhái Sundarji, Jalál-
 Esquire, { pur.
 Kalyánji Savrámbháí Naik, Esquire, }
- G. N. Ghotavdekar, Esquire, Editor, *Shetkari*, Poona.
- D. R. Jáni, Esquire, Editor, *Khedut*, Jámnapur.
- R. P. Karandikar, Esquire, Sátára.
- Bairámsháh D. Dalál, Esquire, Broach.
- Purshottam Anupráam Dave, Esquire, Inámdár, Mátar.
- Raoji B. Patel, Esquire, M.R.A.C., Director of Agriculture, Baroda State.
- Náthábhái Avichildás, Esquire, Karbhari, Vánkáner State.

Officers.

- J. W. Mollison, Esquire, M.R.A.C., Inspector-General of Agriculture in India.
- P. J. Mead, Esquire, B.A., I. C. S., Director of Agriculture, Bombay, Poona.
- Dr. H. H. Mann, D.Sc., Principal of the College of Agriculture, Poona.
- G. A. Gammie, Esquire, F. L. S., Economic Botanist, Poona.
- T. F. Main, Esquire, B.Sc., Deputy Director of Agriculture, Bombay, Poona.

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| <p>J. B. Knight, Esquire, M.Sc., Professor of Agriculture, Poona.</p> <p>G. S. Henderson, Esquire, 2nd Deputy Director of Agriculture, Sind.</p> <p>G. H. Garrad, Esquire, Poona.</p> <p>G. K. Kelkar, Esquire, Inspector of Farms, Deccan.</p> <p>J. Sladen, Esquire, I. C. S., Collector of Ahmedabad.</p> <p>A. L. M. Wood, Esquire, I. C. S., Collector of Kaira.</p> <p>J. H. E. Tupper, Esquire, I. C. S., Tálukdári Settlement Officer, Ahmedabad.</p> <p>R. E. A. Elliott, Esquire, I. C. S., Assistant Collector, Ahmedabad.</p> <p>J. E. C. Jukes, Esquire, I. C. S., Superintendent, Land Records and Registration, Northern Division.</p> <p>P. B. Mehta, Esquire, M.R.A.C., Assistant Survey Settlement Officer of the Tálukdári Estates, Revenue, Ahmedabad.</p> | <p>G. M. Ryan, Esquire, Divisional Forest Officer, West Khándesh.</p> <p>Vináyak Trimbak Agáshe, Esquire, L.C.E., Executive Engineer, Ahmedabad.</p> <p>Parashráam Krishna Chitale, Esquire, L. C. E., Executive Engineer, Gujarát Irrigation.</p> <p>Vináyak Appáji Gupte, Esquire, Huzur Deputy Collector, Ahmednagar.</p> <p>Mr. Gandábhái Eandarji, Mámaldár of Daskrohi, Ahmedabad.</p> <p>Mr. Haribháí Gopálji, Mámaldár of Nadiád.</p> <p>Mr. Natwarlál Maganlál Párekhi, Esquire, District Agricultural Inspector, Surat.</p> <p>Mr. Chimanlál D. Kavi, District Agricultural Inspector, Broach.</p> <p>Mr. J. B. Potnis, Aval Kárkún, Sálsette, Thána</p> <p>Mr. Vali Buksh Adam, 2nd Clerk to the Collector of Broach, Broach.</p> |
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The Chairman opened the proceedings with the following address :—

Gentlemen,—I desire in the first place to express my extreme gratification at the very creditable attendance which we have secured at this Conference, an attendance including many officers and private gentlemen who have come from considerable distances. We take this as an encouraging evidence that the work which we are attempting to do for the agriculture of India is exciting increasingly widespread interest among the intelligent members of all communities in the various parts of the Presidency. We also welcome here some distinguished visitors, including the Honourable Mr. J. O. Miller, Member for Agriculture in the Executive Council of the Government of India, and an old friend and helper Mr. Mollison, the Inspector-General, who must be well-known to many persons in this city and in Gujarát, and whose devoted exertions in the day of the great Famine of 1899-1900, in the endeavour to preserve alive a fraction at any rate of the splendid indigenous breeds of cattle must be fresh in their recollections. As a direct result of Mr. Mollison's initiative, coupled with the munificence of Lord Northcote and the benevolence of local magnates, stimulated by Sir Frederick Lely, the father of Gujarát, we have established the Charodi Cattle Farm, which, now that it has performed its immediate work, is being taken over by Government as a breeding and receiving establishment, and I hope will do much useful work in this part of the country.

Since our last conference we have to lament some serious losses in the Departmental workers. We have lost Mr. Lawrence, whom for sagacity and keenness and power of organisation, it is hard to beat. We are losing Mr. Mead, who has shown his full share of the same qualities. We are, partially only I am glad to say, losing Mr. Gammie, remarkable for his scientific attainments, common sense, and power of co-operation; and last but not least we have been left by Mr. Fletcher, certainly one of the ablest scientific workers who has ever come to this country. Against these losses we have to count several notable gains present and prospective. In Mr. Henderson we believe we have secured an officer peculiarly well adapted to solve the important problems which present themselves in Sind. In Dr. Mann we are obtaining an officer eminent in research-work and an enthusiastic trainer of Indians. In Mr. Main we have a young officer of good promise, while the new Director, Mr. Keatinge, has the advantage over his predecessors in having pursued with great assiduity a thorough course of scientific and practical agriculture which he has developed by additional study on the continent and elsewhere. In initiative and imagination he is fully equal to those whom he succeeds, and I have no doubt that under him the department will continue its steady advance with

the times. In the case of these last four officers at least I trust that we shall retain their services continuously for a good spell of years. The changing of horses just as we are entering the deepest and most difficult parts of a stream, the fords of which we are only beginning to explore, is a most disconcerting process, and I really think we must appeal to higher authorities not to entice away our talent. Our system has already succeeded in procuring us several able Indian workers from whom we augur well for the future.

ORGANIZATION.

Messrs. Bhimbhai, Kelkar and Kulkarni have all proved themselves in their several capacities able and useful officers, and more recently Mr. Pátíl, the son of a Marátha cultivator, who now holds an important post in the College of Agriculture after taking a first rate degree, shows every promise of rendering valuable service. We have three Indian gentlemen in training in England, two of whom will on return become Assistant Professors in the College, while one will get an important post in the department. We also have a gradually increasing corps of Fieldmen and subordinates, many of them graduates, a substantial number of whom we expect to turn out expert agriculturists. The organization and manning of the department is thus steadily progressing; but the skilled personnel is still very small and until it is fully developed the operations of the department are perforce restricted. We cannot provide numerous demonstration farms without skilled Superintendents, nor vernacular leaflets, and lectures without a body of expert translators and speakers. Our principal work besides experiment must consist then in the training of experts to fill the posts which we are anxious to man. The College can provide only a limited number per annum, and unfortunately we cannot expect to receive even the whole of this number. Many it is feared enter the College with aspirations other than agricultural. Witness a student, who the other day, inquired anxiously of a high official whether there would be the same facilities for students in agriculture as there are for students in Arts to go on for the LL.B. Now there is the spirit which stands in the way of success in a special subject like Agriculture. To become a good man in any subject the student should start with an enthusiasm for it, and it lies with the discerning parent to infuse into his son an enthusiasm for agriculture before he places him at the College.

In the meantime we are studying the weaknesses of human nature by endeavouring to provide in the Agricultural Department pay and prospects equal to those obtainable in other departments. If these are provided no able student at the College will have any excuse for preferring another career. For no profession will, in this country, be more useful or admirable than that which contributes to the growth of the proverbial two blades where one only grew before. Desire is expressed for itinerant instructors and lecturers, for numerous demonstration plots for the dissemination of knowledge through the Vernaculars, for Divisional schools, and the like. But for all this we require a largely developed Indian Agency—Farm Superintendents, Demonstrators, Lecturers, School-masters and Assistant masters, as well as experts for inquiry and research. These men have all to be trained. For the present, therefore, I venture to urge as one of the principal objects, which the enlightened gentlemen I am addressing should set before them, is to stimulate the youth of their neighbourhood to take up the subject of agriculture with enthusiasm, and to adopt agriculture whether inside or outside the Government Department as their career, and pursue the study of it at the College.

DEPARTMENTAL WORK.

I will now say a few words about the work done by the Department during the year 1906-07. It is unnecessary to say much as it is excellently summarised in Mr. Mead's report of which you either have or will very shortly have copies.

The most conspicuous work has been connected with the crop which is at present exciting the most attention and of which Bombay produces the most and the best of all the Provinces of India,—Indian cotton. First there is Egyp-

tian cotton in Sind. Despite the ravages of boll worm which greatly diminished the outturn, we succeeded in getting a fair amount of the product. And thanks to the excellent way in which the marketing scheme was organised by the local authorities especially Mr. Chatfield, the Colonisation Officer, and to the enterprise of cotton manufacturers, more particularly those of Ahmedabad, who sent their men to bid, decidedly good prices were obtained. The great difficulty ahead of this crop is that of getting it properly cultivated. The Sind Zamindár is generally blind to this requirement in almost all his crops and lacking the spur of necessity which depends on density of population, and the labour indispensable for good cultivation, having also really more land than he could cultivate thoroughly, or at any rate intensively, nothing will rouse him to overcome his difficulties but an indisputably large advantage in the way of profit we may show him how to cultivate. We may provide him with seed both of cotton, and of the regenerative leguminous crop, "bersim," no less profitable perhaps than regenerative, but he will not adopt the necessary methods, which are laborious, and expensive in labour, unless he can see his way to a clear substantial advantage. To demonstrate this advantage you must give him a good price, the full price which it will pay you to give rather than import the cotton from Egypt if you intend to spin it. You will have to persevere for some years in sending men and bidding liberally, abstaining from rings to bring down prices. There was an attempt at this last year. The operation will be fatal to the new crop. You may get it a little cheap for the one season. But the Zamindár will stop growing it and the chance of getting Swadeshi Egyptian will be lost for a generation.

But besides the securing of good prices for the product until the growth of it is established it would be well for you to do something more. I should like your enterprising capitalists, like Mr. Bomanji Dalal, who has some such excellent work in the Panch Maháls, to turn their attention to Sind, and to take up land there for the cultivation of Egyptian cotton on a large scale, and on scientific methods. They will probably have to do some reclamation to rid the land of boll worm and they will have to practise the Egyptian methods of cultivation and rotation while they may find it advisable to use artificial manures. They may have also to import skilled and industrious cultivators to conduct or supervise cultural operations. Few Zamindárs in Sind have the capital or skill in organisation to undertake work of this kind. But apart from the profitableness of the undertaking the value of a few examples of well managed estates, scientifically cultivated and irrigated, will be incalculable. With the demonstration before their eyes of large outturns and profits the local Zamindárs will be moved to adopt superior methods and the establishment and the extension of this crop, so invaluable to India throughout the areas suited to it, will be made a certainty.

Some further work remains to be done before Mr. Fletcher's inferior Broach hybrids can be regarded as conclusively proved. But should the hopes regarding them or any other improved varieties be realised we have by the extensions at Surat and Dhárwár the land for growing the varieties on a considerable scale and distributing the seed.

I think the introduction of Broach cotton into Dhárwár gives promise of being an absolute success. It would be more satisfactory perhaps if Dhárwár could so to speak breed its own Broach. That may be achieved. But in the meantime there can be no question that a valuable cotton can be grown from freshly imported seed which of course there is no difficulty in procuring.

IMPROVED COTTONS.

But our object is of course to breed and rear our own improved cottons. Dependence on imported seed can never be satisfactory. With these objects we are steadily working at hybridisation, crossing and plant to plant selection. But the establishment of satisfactory varieties must, I fear, be slow, and while the process is being worked through, the Department is, I think, doing admirable and immediately useful work by introducing varieties from one part of the country to the other, as in the case of Egyptian cotton, and we hope Caravonica from outside the country.

In this introduction of new varieties some useful work has been done with Egyptian bersim and groundnut, but so far on a small scale.

In Entomology the principal item is the fight against boll worm. The campaign is not yet concluded. I trust it may end in full victory under the able generalship of Mr. Lefroy.

As regards Agricultural Education we have done no new thing. We are steadily developing the Agricultural College and for the present for reasons already indicated I am inclined to think that is all that we can do. Mr. Joshi has suggested a net work of schools. But schools cannot be had without teachers, and text books, and these are being gradually provided by the College, and I would remind Mr. Joshi that the splendid system of agricultural education in Japan has been preceded by the universal spread of primary education. And until the advantages of primary education have been largely extended among the cultivating classes I think the establishment of agricultural schools is not likely to be undertaken.

SPREAD OF INFORMATION.

Regarding the publication and dissemination of agricultural information I think the Department might possibly effect something more than has been hitherto effected, and I have been interested by the suggestions (*vide* page 29) which have been put forward in response to the questions circulated by the Department. I believe in lectures more than leaflets. But we are short of lecturers. In the meanwhile I think we might possibly manage to circulate information to newspapers other than those mentioned by the Director in paragraph 74 of his report, and I am hopeful that the suggestion of Mr. Joshi to get leaflets read to villagers by the schoolmasters, if not perhaps even by the village taláti or kul-karni, might be usefully adopted. It is to be remembered that our schoolmasters are now receiving a little education in the elements of agriculture in the Training Colleges, and this training would enable them to understand and explain what they read. Without such an understanding nothing perhaps but very elementary matters indeed would be worth having read to the cultivators, who, if they are at all interested, are sure to ask questions and require explanations.

I am a great believer in the usefulness of visits by cultivators to experimental and demonstrative farms. The opportunities for visits will increase with the multiplication of the farms. But for these again we require more trained men. The best method by far for dissemination is the demonstration either on a bit of land in the middle of the tract where the desired improvement is to be introduced. If we have a superior wheat or cotton whether imported or bred, the way to get it known is to have some fields of it growing before the rayat's eyes.

The last piece of work I have to notice is the Surat Exhibition. The palm at that more useful little exhibition was, I think, unanimously given to the Agricultural exhibit. It is to form the nucleus of a Museum collection, to which I hope we may gradually add. The visits of the cultivators to the exhibition, the intelligent and interested inquiries made by them were a most satisfactory feature. I must not pass over the Ahmednagar Show which with its crop competitions was one of the most stimulating and practical shows we have ever had.

There is little left to say regarding the suggestions and answers to questions as most of the subjects dealt with are more or less directly connected with the work of the Department which I have attempted to review, and opportunity for comments on details will arise in the course of discussion. But I shall briefly refer to several of the questions (*vide* Appendix IV).

I hope that discussion may elicit the views of the conference regarding the attempt made in Sind to bring producers of Egyptian cotton into relation with buyers. There Government made arrangements on a small scale for what the Director has called a central market for a special crop. It is needless to say that operations of this kind can be organised by Government only to a very limited extent. We have not the staff, and it is not our business. They show, however, perhaps the line which could be adopted by producers in co-operation with one another. We are continuing the experiment in Sind, and

I am in hopes that we may do something on not altogether dissimilar lines for some of the cultivators of sugarcane on the Nira Canal. The intimate way in which credit is mixed up with co-operation for the disposal of agricultural produce has been hinted at by the Director in his answer, and this is illustrated by our experiment.

PROPOSED EXPERIMENT.

Well, our proposed experiment on the Nira Canal is as follows :—Under that canal we have roughly 8,000 acres of sugarcane. The cost of irrigation and cultivation comes to say Rs. 375 an acre, the value of the produce to about 500. The profit ought to be not far from Rs. 100. It is generally far less than half that often not more than Rs. 30. The reason is the heavy amounts which the cultivator has to pay for the advances of money necessary for him to pay his water rates, for his sets, his manure, and preliminary expenses of cultivation, and the brokerage on the disposal of his produce. If he is left Rs. 40 these extra expenses absorb Rs. 85 or over 20 per cent. beyond what might be called the net or actual expenses of cultural operations. There can be little doubt that these extra expenses could be halved by good management. The cultivator borrows usually at 18 per cent. mostly from small *sávkárs* who pay 9 per cent. for the capital they lend him, he pays a gigantic retail price for his oilcake manure which is sold wholesale mostly here in Ahmedabad, and finally a heavy brokerage on his *jagri*. We propose to finance some 500 acres belonging to selected cultivators, by lending them money as *tagái* at 9 per cent., buying oilcake for them and selling at a trifling brokerage if they so desire, and finally marketing their *jagri* for them more or less on the lines adopted for Egyptian Cotton at Mirpurkhás. Our *tagái* will be advanced at 9 per cent., and we reckon to work at a small profit, say 3 per cent. after paying for the cost of the special establishment employed. As the money will be advanced under the Agricultural Loans Act, we shall have the power of summary recovery to give special security to our operations. But we hope to demonstrate that it will be altogether unnecessary to exercise this power, because the security will be the valuable cane-crop, failure of which is almost impossible owing to the water being provided from the great storage work at Bhátgarh. It is hoped by this experiment merely to point the way in which a Land Bank on the Egyptian lines might finance special crops of this kind. To finance the whole of the Nira Canal would require loans of some 32 lakhs per annum. But the financing agency would probably have to help in marketing the produce, and might have to help in providing the manure. The experiment will be very interesting at least and, I hope, may prove successful.

ASSOCIATIONS.

I propose in conclusion to say a very few words about associations. In an elaborate paper Mr. Joshi has dwelt at great length on the advantage of associations, and has proposed a network of them from the village up to a Central Association. This system has been found in full operation in many countries, including Japan, regarding which country I have been able to obtain some invaluable information from a most informing note compiled by Sir Frederick Nicholson, the author of the well-known report on Land Banks and Agricultural Indebtedness in the Madras Presidency. I am anxious to thank Mr. Joshi for his paper. It covers an immense amount of ground and makes several suggestions of a most far-reaching character, and very general in their terms, too general and far-reaching, I fear, for most of them to be adopted as immediate practical measures or to be dealt with at this conference. They are some of them excellent ideals to be followed and worked up to in time. But what we have to consider is the immediate present. In that I am anxious to say that I regard with anything but disfavour his suggestions regarding Associations. I am not at all sure that we cannot take some steps in the direction he indicates at once. I see nothing impracticable in the appointment of Pancháyats in considerable villages to be a means of communicating information to the Agricultural Department, making known their special wants, and making inquiries as to the mode in which local agriculture might be improved and difficulties overcome. Neither should I object to the formation of Táluka and even District Associations for the same purpose, even in advance

of the village Pancháyats ; I regard several associations which already exist as already doing useful work, though they are only at their beginning. There is the Dhárwár Association which has successfully distributed improved implements. There is the Sangamner Association which is occupying itself with improvement of the local wheat crop. I gather that Mr. Joshi considers that such associations might benefit if they received legal recognition and some help. In this I can at present see nothing disadvantageous or impracticable. We have already Sanitary Committees in the larger villages and Co-operative Credit Societies in villages of every size recognised by law. I cannot see why agricultural associations should not be constituted on similar basis or why perhaps Co-operative Credit Societies should not be encouraged to form themselves into agricultural associations. What is essential is that such associations should concern themselves with matters agricultural and that they should be truly representative of the cultivators. With such societies we should be thankful to correspond, to answer questions, and so far as our agency permits to depute experts to examine into local requirements. It would at least be a matter of consideration whether they should not have access to the local statistical land-records. What other functions they could be given would be a matter for consideration. Perhaps something may be elicited regarding this in the course of discussion.

I have already said that I wish to thank Mr. Joshi for his paper. I wish to thank him still more for having taken the trouble to write a comprehensive paper of the kind at all. The contribution must have cost him considerable thought and labour. If similar trouble will be taken by other thoughtful men I hope that the amount of information we may have to work on in the Agricultural Department will be largely increased.

Gentlemen, I will now close. I trust that our conference may elicit useful discussion, and intelligent inquiry to which we may be able to give some satisfactory answer, and businesslike resolutions which may suggest to us definite lines on which we may effect practical improvement in the agriculture of this Presidency.

Mr. Flether's paper* on cotton was then taken as read and the Chairman proceeded to invite discussion on the subject.

Mr. Chinubháí Mádhavólál of Ahmedabad said that there were several mill-owners in Ahmedabad who would like to have information supplied to them from time to time as to the different varieties of cotton grown on Government farms in the Presidency, the places where certain improved classes of cotton were grown, the extent of their cultivation, and how different classes of cotton were to be obtained. At present they had very little information on these points. He thought a collection of different kinds of cotton grown and experimented upon Government farms should be placed at the disposal of the mill-owners, so that a greater impetus might be given to the cultivation of the superior kind of cotton.

The Chairman asked if the Mill-owners' Association would place the collection at the disposal of the public and construct a building to house it. The cultivators also should have free access to it.

Mr. Chinubháí Mádhavólál replied if the Government gave the mill-owners a free site they would arrange to place for public view samples of improved cotton supplied to them by Government.

The Chairman said the Agricultural Department was certainly ready to give any help in its power and the proposal would be considered by the Government.

Mr. A. K. Leslie pointed out that the mere seeing of the samples would not give the spinners a proper idea of the nature of the staple. The samples should be in sufficiently large quantities to enable them to examine by pulling them into pieces and to form an opinion as to the relative value of the different kinds of cotton shown.

Mr. Chinubháí after consulting some of the mill-owners present said that 5 to 10 lb. samples would be sufficient.

* Appendix 1.

Mr. P. J. Mead asked to what extent Government were expected to provide samples.

Mr. Chinubhai Mddhavlal replied that the Collectors of the cotton growing districts might be asked to supply samples of the best, medium and lowest grades of cottons grown in their districts. The mills would experiment with a new variety of cotton if they were furnished with at least five bales.

Mr. P. J. Mead explained that Collectors were not judges of cotton but could probably provide annual samples from such tracts or even villages as the trade might suggest.

The Chairman said the matter evidently required a great deal of deliberation and thought as to details. He thought the best course for the mill-owners to adopt was to make their offer after full consideration to the Director of Agriculture, and when they got into correspondence, he had no doubt that they would manage to evolve a useful scheme. He assured them that Government would be ready to give any reasonable help that might be required.

Mr. Chinubhai next suggested that cotton shows might be held and in order to make these shows really successful the exhibitors should be offered prizes of, say Rs. 250 or more, for parcels of 20 or 50 bales of cotton, so that the cultivators might be encouraged to grow superior kinds of cotton.

Mr. Ambáshanker U. Malji said the holding of agricultural shows should not be confined to any particular district. They should as much as possible follow the holding of local fairs, such as the Shuklatirtha Fair.

Mr. T. J. Ward said that though the work done on the Government experimental farms was an admirable one, he considered that after ten years of experiments they had not been able to produce anything on what he would call a commercial scale. So far they had not gone beyond Egyptian cotton grown in Sind, but what the trade wanted was the production of improved Broach, Dhárwar and other classes of Indian cotton on a commercial scale.

Mr. A. K. Leslie and *Mr. Nárándás Purshottamdas* expressed similar views.

Mr. Raoji B. Patel, Director of Agriculture, Baroda, said the trade did not seem to give much help to Government. The real difficulty from the agriculturist's point of view was this. It happened that when a cultivator failed to produce a crop at profit with the new seed supplied to him by the Agricultural Department, he was not encouraged to go in for it again in the following year.

Mr. R. E. A. Elliott thought that if the buyers paid the producer of an improved variety a little better price than that of locally grown cotton it would encourage him to continue the experiment. He suggested that either the Bombay Chamber of Commerce or the Mill-owners' Association should take up this matter.

Mr. Leslie said that traders could not pay higher prices for small parcels of improved varieties of cotton as they would not be able to dispose of them. They would certainly buy at higher rates parcels of 50 bales.

Mr. P. J. Mead asked what minimum quantity the mills would be willing to experiment with.

Mr. Chinubhai said five bales would be the minimum quantity with which the mills would experiment.

Mr. Millard suggested that Government should purchase improved cotton at higher rates.

Mr. P. J. Mead remarked that at the last conference at Cawnpur the view was expressed that Government should not offer fancy prices as when such artificial stimulus was removed and prices were regulated by the usual laws of supply and demand, it was not unlikely that the real market price would prove lower than the prices offered by Government and disappointment would result.

Professor G. A. Gammie described the difficulties against which the Agricultural Department had to contend in the beginning of its career. At

first it was necessary to find out the distinguishing characters of the Indian cottons and the methods to be adopted for their improvement. Only small quantities could at first be dealt with. The collection of this information took some time. Then the work of classification was undertaken and took up three years. Then plans were immediately devised for the improvement of the cotton, and Mr. Fletcher was successful enough to evolve two or three kinds of cotton which was very much superior to what was being already grown. In the case of these varieties the Department would next year be in a position to grow a few acres of each in the field. As regards the selection of seeds of improved varieties they had also carefully kept that in mind. The necessity for selection was now understood by the cultivators in the Karnatak. They understood the superiority of green-seeded to white-seeded Dhárwár-American. They were enterprising enough last year to introduce Broach seed in two talukas which received early rainfall. The price obtained by them for this cotton was much higher than what they received for the local cotton as the former gave a higher percentage of lint. In consequence of their success in the experiment they had gone in for the cultivation of this variety of cotton on a larger scale and with better results. One difficulty which the Department experienced was that once they introduced a large quantity of seeds in a certain place there was no guarantee that they would not be mixed up with other varieties. The Department would appreciate any suggestions which any member of the conference might make on this matter.

Mr. Leslie thought that the owners of ginning factories could easily arrange to keep the seeds separate. The real question was whether the improved variety could be produced on a sufficiently large scale so as to put it on a commercial basis.

Mr. A. L. M. Wood, Collector of Kaira, said that his experience of the owners of the ginning factories in Gujarát was that they would refuse to separate selected seeds in small quantities. The gins wanted to do as much work as they could in as short a time as possible.

Mr. T. J. Ward said that the owners of ginning factories in Berárs took very good care to keep the seeds separate by ginning each parcel separately and by cleaning the gin of seed before a fresh parcel of seed cotton was handled.

Mr. Narandás Purshottamdás said that in Broach as in Berár owners of seed-cotton took it to gins and got their seed back.

Mr. P. J. Mead, in reference to the suggestion that the Department should purchase seed-cotton for seed, said that he would prefer to buy back seed at a high price rather than purchase cotton which entailed a large budget provision and the possibility of considerable loss if the rate fell between the purchase of kapas and the sale of ginned cotton.

The Chairman said that the difficulty about the budget might be removed and closed the discussion by saying that he wished to express his sense of the practical usefulness of some of the suggestions that had been made, some of the difficulties that had been brought to light, and the criticism passed on the work of the Department. He assured them that these criticisms would be carefully considered.

Mr. Gammie's paper on rubber was then taken as read. (Appendix II.)

The Chairman next invited discussion on the question of giving vernacular instruction on certain selected Government farms (*vide* Appendix IV).

Mr. D. B. Jání said that attempts from time to time had been made to open classes to make agricultural instruction popular, but they mostly failed, and there were many reasons for the failure, the chief being—

“(1) want of proper vernacular text-books ;

(2) want of enthusiastic teachers having a thorough practical knowledge of the present agricultural practice ;

(3) want of equipment on the farms to teach agricultural and allied sciences ;

(4) the aim of students in attending these classes is more to qualify themselves for some employment than to be actual farmers;

and lastly, (5) they are not trained up in the habits and traditions of the farmers. These students have had no manual or technical training along with their primary or secondary education, as none is imparted in schools. They, therefore, practically have no knowledge of agriculture or its practice at the time of joining such classes.

Arrangement, must, therefore, be made to set apart a portion of the farm for farming according to the best native practice of the district in which the farm is situated, and place it under the supervision of an experienced farmer. It should, in fact, be made a 'Model native farm' and students be first put upon it, as apprentices, holding separate pieces of land and carrying out all the operations of the farm themselves, *viz.*, ploughing, weeding, hoeing, sowing, harvesting, threshing, carting, and even marketing, watching, tending plough and dairy cattle placed under their care, milking, churning and other operations too numerous to mention here, but all the same essential to successful farming.

In the afternoons for two or three hours daily they should be taught the theoretical portion of the subject. In the course of two years they will have acquired sufficient manual training and learnt the scientific principles. In the third year they should be placed on the experimental farm proper and taught the modern or improved system of agricultural practice and methods of investigations, &c.

They should be given free board and lodging on the farm and bred up in the habits of farmers. If their 'practice' is made sound, additional acquisition of 'science' will make them the 'model modern farmers' we are so much in need of."

Dr. Mann said that he felt that day that there was no more important question that could be considered there than the means of bringing the information in the hand of the Department of Agriculture into the hands of those who lived in contact with the land. The success of the Department must ultimately be judged by the extent to which it could do so. He for one, should feel that they had failed, however much interesting and valuable information was obtained unless they could bring that to the notice and into the practice of cultivators.

The question before them then was as to the extent to which Government farms could be used for that purpose. On the whole he was not in favour of any attempt to create at present general classes in agriculture in the Vernacular on these farms. The short time which the cultivators would be able to spend would be insufficient to serve any useful purpose. But he did think nevertheless that the Government farms could well be utilized for bringing the results obtained by the Department to the notice of cultivating classes provided three points were kept in view. The first of these points was that such instruction should be on specific questions and not on general subjects. Thus there had been evolved methods which would secure improvement of seed by regular and systematic selection. Those methods could be applied by any cultivator with a little special training and already there were men, he believed, being instructed in them on one of the Bombay Farms (Surat) as regards cotton. Similar instruction might well be given to cultivators on the other farms. Then again from what he had heard of the manner in which the dairying industry was carried on in Gujarát there was much room for a very useful short course or series of short courses in that subject. Then from what he heard when recently in England, it would be of great value if the cultivators could be instructed in the methods of reaping cotton in vogue in Egypt. And finally there were then a number of diseases of plants such as smut in wheat or jowár which could be treated with certainty and the methods by which that could be done could well be demonstrated to the actual cultivators on the Government farms. It was in such matters as these that instruction in the Vernacular might be of untold value.

But after all such instruction must await the provision of trained, competent practical men—men who were cultivators by temperament and training

and so could be respected by the rayáts and yet men who had had the advantage of the best training then available. The first duty of the Agricultural College of which he was in charge must be to provide such men. Some had been already turned out. He had several such actually then in mind who promised excellently for that purpose. But these must be multiplied—would be multiplied—and only then would the Department be able to bring their results to the notice of the cultivating classes. Again he thought that such instruction could only be successful when worked in co-operation with local Agricultural associations. The latter knew the local needs better than any officer of the Department. They knew the cultivators who would most benefit by the instruction, and they were alone able to foster that local enthusiasm which alone could make the short courses of instruction a success.

Given these conditions there seemed no doubt in his mind of the utility—of the great utility—of such short courses of instruction on specific subjects as he had suggested. He should be prepared personally to do all he could to make these courses a success and should always have the greatest interest in them as bringing the best agriculture where it ought to be—in the hands of the cultivator of the soil.

The Chairman said that Government were in perfect accord with the remarks that fell from the last speaker.

Mr. J. Mollison said that he attributed the success of the Bombay farms in a large measure to the thoroughly trained native field assistants.

Discussion was next invited on the use of Vernacular Newspapers.

The Chairman said he should be very glad if some widely circulated vernacular newspapers in the country—whatever their views on politics might be—would open a column for agricultural news. He assured them that Government would do their best to supply them with the necessary materials.

Mr. D. R. Jáni said the use of the Vernacular Newspapers should be made as much as possible, as their circulation was fast increasing. All important centres now-a-days got one or more such papers which were eagerly read by the intelligent general public. But technical subjects like agriculture were likely to be obscured by the overwhelming matter on political, social and other subjects, they were naturally filled with. Even the villagers who got opportunity to read such newspapers were likely to ignore agricultural subjects and be led away by exciting and interesting general news. The farmers required a purely agricultural paper, which they could read and digest with undivided attention. Education was fast spreading in rural areas and either a school-master or some intelligent villager would generally be found in almost all important villages to read over and explain to the assembled farmers any agricultural subjects.

To supply the want of a purely agricultural journal, he said, he revived the "*Khedut*" three years ago. It treated of purely agricultural subjects. It was well received by the public and the press, and was approved both by the Agricultural and Educational Departments of this Presidency, the former having already arranged to publish its agricultural bulletins through it.

Free distribution of agricultural information through leaflets was carried out by the Agricultural Department with good results, and the Department should continue it on a much larger scale. But there was a limit to free distribution and encouragement should be given to farmers to subscribe for the Agricultural Journal—the "*Khedut*," the subscription being equally shared by the farmer, the Local Board, and the Agricultural Department. The subscription of the Journal was Rs. 2-6 per annum, including postage, and he would be willing to lower it by 8 annas, making it Rs. 1-14-0. Thus a *bond fide* agriculturist would have to pay only 10 annas, including postage, the rest being made up by the Local Board and the Agricultural Department. The Native States, Japti and Court of Wards estates, and Talukdárs might make similar arrangement. Such encouragement was necessary at least for the next five years.

Importance of agricultural literature could not be overstated. It was the chief means of bringing home to the farmers the results of the labours of the

Agricultural Departments, and it would pave the way for agricultural improvements and prepare the farmers to appreciate the supplementary work of itinerary lecturers and demonstrators much better.

Mr. Náthábhái Avichildás Desai made similar remarks.

Sirdár Cápúsowámi V. Múdlíar said that the Agricultural Department had been doing a good deal for the betterment of agriculture during the last 15 years, but the class of people (agriculturists) who ought to have been benefited the most, were not in the least better, but were still blindly following their old ways and using the same primitive implements. He added that it was the well-to-do non-agriculturists, who had taken up agriculture during the last 15 or 20 years, that were benefited by the work, experiments, and the improved implements introduced by the Department. He further said that unless the improvements and reforms in agriculture were carried to the very doors of the agriculturists, he did not think that they would ever care to know what the Department was doing for them. In his opinion the newspapers as a whole would not be able to spread or extend the agricultural knowledge to the agriculturists, but a great deal of good might be expected, if papers exclusively devoted to agriculture, were to take up the experiment.

The Sirdar remarked that one of the speakers had said that agricultural papers might be supplied to agriculturists at half price, but even this, he knew, would be no attraction to them. He proposed that 2 or 3 copies of papers containing agricultural information should be supplied free to every village monthly, to be read to the agriculturists and that the leaflets issued by the Agricultural Department from time to time, would go a great way in attracting the notice of agriculturists. He considered this a very handy way of carrying agricultural information to the agriculturists.

Mr. P. J. Mead explained that the reason for selecting the *Shetkari* and the *Khedut* for dissemination of agricultural information was that he wished to get a certain piece of work done by them for the Department. An arrangement with the editors of these publications had been entered into for the publication in the vernaculars of bulletins, leaflets and other contributions from the Agricultural Department.

CROP ESTIMATES.

Mr. Leslie then inquired what method was adopted by Government in estimating the crops. It appeared to him that the Government in estimating it in a certain manner conveyed a wrong impression. He had noticed that the Government called an ordinary normal crop as 12-anna crop, and a bumper crop a 16-anna crop. The public, however, called an ordinary normal crop a 16-anna crop, and a bumper crop a 20-anna crop. If they considered a rupee as the unit, then an ordinary crop should be termed a 16-anna crop.

Mr. Mead said he had not full information on the point, but so far as he remembered Government had adopted the present method in consonance with the way in which the cultivators themselves were accustomed to estimate. There was no objection so far as he was aware to giving the trade percentage estimates if they preferred them.

Mr. R. P. Karandikar enquired whether in all Government estimates a 6-anna crop was understood to be half of a 12-anna or normal crop.

Mr. P. J. Mead said that he had not the information before him.

The next subject taken up for discussion was : "The uses of Agricultural Associations."

The Chairman in introducing the subject said he attached great importance to the connection of such associations with villages and with genuine cultivators. Government considered it of utmost importance that the cultivators should be fully represented on these associations. The Chairman then read the following extracts from Sir Frederick Nicholson's Note on Agriculture in Japan to show the development of similar institutions in that country :—

* * * * *

The members of Town and Village Associations (in Japan) shall be the proprietors and cultivators of land within the boundaries of the Association; County (Táluk) Associations shall be constituted from the Town and Village Associations within the County, and Prefectural (District) from the City and County Associations within the Prefecture. Before any Village Association can be formed not less than two-thirds of the persons qualified for membership shall consent, provided that such two-thirds own not less than two-thirds of the cultivable land; but when such Association shall have been formed all persons qualified for membership must join it. * * * * All Associations must report on agricultural and other matters as required; these reports appear to be the basis of the very detailed statistics presented in the annual report of the Agricultural Department; they are also entitled to make suggestions on agricultural matters.

* * * * *

The Kanagawa Prefectural (District) Association consists of deputies from the 11 Táluk Associations, and its objects as declared in its rules, are

- (1) the statistical investigation of agriculture (within the prefecture);
- (2) agricultural education;
- (3) agricultural improvements;
- (4) improvements in the secondary occupations of farmers;
- (5) the encouraging of the formation of agricultural associations;
- (6) supervision and encouragement of táluk associations;
- and
- (7) any agricultural matters of importance and urgency.

* * * * *

The following is the record of a Táluka Association in another district:—

“(1) A competition in rice growing amongst the 11 constituent villages; each plot was of not less than $\frac{1}{8}$ th acre (600 square yards), and the Association appointed 5 Inspectors to visit each village, select the most successful example and award the Prefect's prizes. This excited the keenest interest and much effort to win the prizes.”

* * * * *

“The village association gets down to the people even more than its name signifies, for the association may be sub-divided into as many sections or branches as there are hamlets, of between 20 and 40 houses, in the village, and each branch has its own councillor in the association and also its own local head and councillors, the latter representing groups of five houses; this method was decided in a general conference to be the best method of representing village opinion and of communicating information to the individual members.”

Mr. *Ambdshankar U. Malji* next said that he was connected with the Broach District Association for over three years and that though the efforts of his association were admitted to be not so very successful in villages he was sure they had made out a case for the necessity of the Village Associations.

The associations that the Agricultural Department required were agricultural exclusively and it was therefore necessary to begin with villages and not districts or tálukas. There would not be much immediate work for the District Associations in point of agriculture. Besides the idea of establishing these associations all over the country was rather ambitious and as the department had been experimenting on various matters a few associations might be formed as a beginning in some specified villages.

He observed that the necessity of forming such associations was obvious. The Agriculturists did not know what should be the rotation of crops. In order to realise better prices the cultivator sowed the same crop year after year and this exhausted the capacity of the land. The cultivators also did not keep the land fallow as they used to do in the past. Human beings required recreation after some hard work and naturally the land must have a similar recreation itself. The land deteriorated if worked continuously and required to be

renovated. The Pátidár agriculturist also had commenced to neglect to cultivate lands himself and if that sort of thing continued longer he was afraid it would produce very dangerous results to agriculture.

Mr. Malji further remarked that the Agricultural Department should extend its sympathies to the cause of agriculture and teach the agriculturists at their own houses on the above and many other important points. In his opinion this was quite possible by establishing these associations. Circulars and bulletins issued by the department would be very useful. The Broach Association looked into matters agricultural along with others and before concluding he had only to mention that his own services were at the disposal of the department in any matter of importance.

Mr. Dámodar Keshao Parasharámí said that these associations were gradually coming into existence and that their number was likely soon to increase. He, therefore, considered it necessary that there should be some clear and definite ideas as to how they should be pioneered and how they could best carry out their purpose. There had been several District Associations and one had recently been established at Nagar. One Táluka Association had also been established at Sangamner. The speaker said that he had something to do with the last, and briefly explained how they were running it and what objects they had in view.

A Táluka Association was midway between a District and a Village Association. A Village Association, however desirable, seemed a long way off, as there was no material available just then for it. A Táluka Association could prepare this material. It could teach the villagers and afterwards make them do the work themselves. The Sangamner Association contained several members who owned lands in villages and cultivated them through their servants. They, therefore, knew the villagers and the villagers knew them. Members were not required to write long essays or to pay big subscriptions. But they were expected each in his own village to do something in the way of agricultural improvement by way of new experiments. The cultivators watched the results of these. The members also enquired whether the experiments succeeded or not and, if not, why not. Very often the cultivators did not carefully carry out the instructions given them and attributed the failure of the experiment to the unsuitability of the seed or to the soil and climate. If such experiments were carried out under intelligent direction and supervision, better results might be expected. The Association expected its members to do this. The members were carrying on experiments in growing better kinds of cotton, wheat and bajri, and some new chaff-cutters had been purchased. Arrangements had also been made to purchase an iron turn-wrest plough. With the help of Government and the Local Board, the association hoped to hold a small Agricultural Show. ✓

Another object of the association was to encourage discussion by agriculturists on agricultural matters. They discussed such matters with agriculturists and encouraged them to engage in such discussions. They also suggested remedies. Success in that direction must be slow. Cultivators generally fought shy of such discussions. The speaker concluded, saying, that he would not be far from wrong if he stated that the cultivator himself had no clear ideas about his wants but, by such discussion, they compelled him to be precise and accurate, and to think for himself. In many cases they succeeded in clearing away his hazy ideas.

Mr. Parasharámí added that this point was specially kept in view at the time of the last Agricultural Show at Ahmednagar. The Collector met the deputations of cultivators and asked them their grievances. Many had none to tell or more rightly could not tell them. Some had some indistinct or incorrect ideas about them. For instance, in some cases, the cultivators complained about the system of levying the grazing fees. They were told that the remedy was in their own hands; and that they could have the grazing lands by paying a lump sum agreed upon between the Revenue Officers and themselves. The proposal appeared to them simple enough and would, he believed, be adopted in many villages.

In the speaker's opinion what should be the special aim of these associations was that the villagers should be made to think for themselves and to state their case themselves.

With reference to suggestions that such associations should be started *suo motu* by the cultivator, that the cultivators should state the facts from their own point of view, that they should state their difficulties clearly and their requests precisely, *Mr. Parasharāmi* said that such associations, when they came, would be most welcome and useful; but their growth should be real and intrinsic.

They should spring up from below and not be grafted from outside. Just then there was no material for such associations. There were hardly a dozen intelligent cultivators in a *táluka* who would understand such matters and even they could not act independently, but must look to others for advice. The village Panchayats, which formerly supervised the village affairs, had gone. The present cultivator was wanting in intelligence and experience to take part in such matters. This was a matter for time and education. Until such associations arose and agriculturists were able to take part in them the *Táluka* Associations could, in the speaker's opinion, well fill their place. It should be the chief aim of these associations to study on the spot the cultivator's wants and to represent the latter to Government and also to explain to the cultivators what the department was doing and make them take advantage of it. It was by honestly interesting itself in all questions affecting the prosperity of the agricultural classes of the *táluka*, that a *Táluka* Association could be really useful and it was in this direction that he would urge the formation of *Táluka* Associations.

Two points should be clearly kept in view—the association should be truly representative of agriculturists and should restrict itself to agricultural matters, and there was no doubt that these covered a great deal of ground.

Mr. V. A. Gupte said that his friend *Mr. Dámodar Keshav Parashrámi* had already explained the working of the Sangamner *Táluka* Agricultural Association. They had recently established a District Association at Ahmednagar. The Chairman had just mentioned that these associations should fulfil two conditions, *viz.* :—(1) that they should be genuinely representative and (2) that they should do genuine practical work. They had kept both these points strictly in view; the conditions of membership were that the intending members should hold land and cultivate it themselves, and that they must agree to undertake some experiment if required. At present they had no material for Village Associations. The cultivators were ignorant, and the communal feeling had long disappeared. They had to establish it again. Until that was done their reliance must be on *Táluka* and District Associations. By these he did not mean associations formed on representative principles from the cultivators in the *táluka* or in the district. They could not claim that distinction for their associations. But they were associations of practical men from the *táluka* and the district who themselves carried on agriculture and had collected together to improve it and look after the agricultural interests of the cultivating population within the *táluka* or the district. These associations could send their roots downwards and reach the individual cultivator in the village. Land was now gradually passing into the hands of the middle class, some of whom were cultivating it themselves through their servants. These men were intelligent; they could understand the improved methods and adopt and show them to the villagers. These, and the few intelligent Patils and Kunbis available, made up their associations. They were getting new and improved implements, sowing selected seed and introducing a system of plant to plant selection of seed. They also expected to be able to hold Agricultural Shows. Their educative influence must go downwards. This, coupled with the spread of primary education, would, in course of time enable the villagers to form their own associations and represent their wants in their own words. It would then be time for these associations, in the words of the Director of Agriculture, "to spring up from below and not be bolstered up by official influence." Until then the *Táluka* and District Associations must do their work. They should, therefore, be used to the fullest advantage and it was in this respect that cordial and sympathetic assistance was asked for them from the Department.

Mr. Ambálál Khandubhái Desai said that they had started an Agricultural Association in the Jalápur *Táluka*, in the Surat District, which was solely representatives of the agriculturists. Their main object was to bring the culti-

vators in touch with Government and the Agricultural Department; for this reason they had applied to the Director of Agriculture and had received a sympathetic answer. They asked the Department to lend them agricultural implements, so that they could introduce them in their táluka. Also the Department should encourage the cultivators to use scientific manures to rear new crops. The association on its part was ready to help the Department. The speaker stated that he and his colleagues were in favour of the Táluka Association and not the District Association, and that Government should encourage the agriculturists to form Táluka Associations.

Mr. Haribhái Gopálji said that, in order to give a practical effect to the efforts of the Agricultural Department, that Department should earnestly desire to enlist the sympathies of the agriculturists. The agriculturists were not quite in touch with the Department and its aims. In fact, the Department had not the means to know the shortcomings of agriculturists. To meet this, all Agricultural Associations were indispensable, and these latter should represent the village population. Village Associations should, therefore, be formed first. Their objects should be :—

- (1) To report instances of deterioration under the present cropping.
- (2) To suggest new crops on improved lines.
- (3) To suggest improvements in agricultural implements.
- (4) To report about the Takavi requirements in cash or kind.
- (5) To consider the question of cattle-breeding.

Mr. Haribhái added that there would be many other things connected with these questions and the advice of the department would be very valuable. The agriculturists should have facilities to communicate their views to Government and the latter should also have the opportunities to know more about them. Further points requiring elucidation would also develop themselves in due course. What was necessary was a right beginning, and, though the idea of establishing Associations all over was rather ambitious, the same could prove very successful in course of time. The deterioration of land was a question which required early attention of both Government and the agriculturists. The agriculturists did not know what crops they should sow in rotation. They did not, besides, care to keep the lands fallow as they used to do before. These and other kindred questions could well be disposed of with many benefits to agriculturists if they looked into these things under the instructions of the department conveyed by circulars and bulletins.

Mr. Ráojibhái Patel said that all the three kinds of associations—district, táluka, and village—were necessary. He described how the Amreli Association was formed by the people themselves, patels and other leading people joining together. There were no fees. The association held a show to which exhibits were received from Poona, Surat and other places. He further remarked that Amreli was the táluka of the Baroda State which had been selected for compulsory primary education.

Mr. A. L. M. Wood, Collector of Kaira, referred to the remark made by a previous speaker that there were hardly a dozen men of the right sort in a táluka, and said it might apply to the Deccan, but not to Gujarát, where there were hundreds and thousands of such men. He did not know what the old punchayats were in the Deccan, but the name did not exist in that part of the Presidency. In Gujarát every village had its corporate body composed of the Matádárs or heads of the leading families. He ventured to suggest that the Government should recognise these bodies for general purposes in regard to agriculture. If they would treat them as a committee of village agricultural association, they would be readily recognised as such by the villagers. That would be a more natural procedure to adopt, than to create some new bodies, impose upon them occidental names and put before them long sheets of printed bye-laws. He thought that what they wanted was to recognise these existing corporate bodies and deal directly with their heads. But if they decided to go in for associations, he agreed with *Mr. Ambálál* that Táluka Associations would better fulfil the object in view.

✓ *Mr. D. R. Jání* said that Village Associations should be purely agricultural and should have nothing to do with the discussion of questions relating to revenue and forest administration. He advocated the formation of Rural Associations and hoped that a number of them would be formed if the department would sympathize with them, and in addition to its expert advice, give them help in the matters noted below irrespective of their being situated in British Territory or Native State:—

- (1) Free supply of seeds, manures, &c., for trials by members on a small scale.
- (2) Free loan of improved agricultural implements for use for a year or so, to make them popular.
- (3) Supply of seeds, manures, implements, &c., at cost price if required in any quantity.
- (4) Free supply of Bulletins, &c., distributed by the department.
- (5) Making analyses of soils, &c., and valuation of new crops without any charge.
- (6) Identifying specimens, solving difficulties, giving advice, and supervising their operations as far as possible. ✓

He further said that if the department will promise this help he would use his influence to form such associations and use his Journal as a medium of communication between them and the Agricultural Department.

Dr. H. H. Mann said he was exceedingly interested in the discussion that had taken place, because the formation and use of Agricultural Associations was one of those matters with which he had been intimately connected on the other side of India. He had watched with some interest the progress of the Bengal Provincial Agricultural Association and he found that it proved a very big failure. It was formed on a large scale with the object of creating a central body for discussing agricultural subjects and distributing information. But it failed to perform either of these two functions. With that experience to go on in Bombay he should be very loath to advise or suggest the commencement of this development of popular interest in agriculture by the formation of a large central body. His feeling would be entirely in the other direction but so far as it seemed to him to be practicable they should begin with the lowest units, that was to say, with Village Associations. Perhaps it might be found advantageous ✓ to have Taluka Associations in some districts and Village Associations in others. ✓ It seemed to him that these associations should be purely agricultural and absolutely in close touch with the cultivators and those who could give them the best advice on matters agricultural. He thought an association of that sort might fulfil a very large number of exceedingly important functions. There were ✓ various ways in which it could be useful. In the first place, it could do what no officer could do by way of informing the department what was going on on the country side. Then it could give the first information as to the existence of a serious agricultural pest in any locality. It was of the highest importance that the department should know of this at the earliest possible time, so that it could send its experts to the place who could put in use the very best knowledge in their possession for the destruction of the pest. The next thing which the association could do was to bring to the knowledge of the department the existence of the deterioration of the crops and of the land. A member had suggested that to keep the land in good cultivable order it should be allowed to remain fallow for some time after a certain period, but he might say that instead of doing this it was possible for the department, if informed, to suggest other methods of preventing the land from being deteriorated. Then the department might help in the matter of cattle breeding. It would also welcome any assistance that might be given to it by an Agricultural Association for introducing new seeds and new manures. Finally such an association might help in giving instructions as to the better utilization of irrigation water. Of course, the advice ✓ which the department would give could not be considered as final and satisfactory. He was afraid for many years to come it could not be final and satisfactory, but probably it would prove the best advice that could possibly be

obtained in the Presidency. For himself, he would be only too pleased to deal with any difficulty that was brought to his notice. With regard to agricultural shows Dr. Mann did not think they were utilized nearly to the extent it was possible to do, and the Agricultural Association might do a useful service in that direction. There was one other matter which Mr. Mollison had suggested to him. It was a matter on which, he thought, it might be possible for him to speak unofficially. It was that arrangement should be made to have a specially trained and thoroughly practical man, who could go from village to village and from taluka to taluka and give the advantage of his training and knowledge to the village cultivators through the Taluka Associations. Lastly, he thought there should be no attempt to force the organisation of an association. Unless these associations arose spontaneously in a district, taluka or a village they would really be not in touch with the national life of the people as they wanted them to be. Before he sat down he would say on behalf of the expert staff of the department that if these associations were organised, they would be too pleased to give the best of their time and advice to make them a great success.

Mr. Náthábhái A. Desai advocated the opening of a class where pupils could be taught to select seeds, farming, dairy work, preparation of manure, etc. If such a class were opened a good many men would come forward to learn these things, and would subsequently be available for the work of instructing village cultivators. For teaching these things they did not require highly trained graduates in agriculture. He thought before establishing agricultural associations, they should create a class of teachers as he suggested, so that when the associations were subsequently formed, they could have the assistance of these men to carry on their work. He suggested that Government should open such a class.

Mr. P. J. Mead said it seemed to him that the discussion had proceeded on two lines; firstly, to determine the best way in which they could give advice and help cultivators, and, secondly, to determine in what way the department could get the fullest and most accurate information from the cultivators. The staff of their experts was small, and it was almost impossible to investigate any set of conditions or to get a general agricultural survey of the Presidency for many years to come. They were doing it piece-meal and as they got a representation about any agricultural problem in a given district, if it appeared to be of sufficient importance they endeavoured to detail one of their few experts to look into the matter. But local information was absolutely essential before they attempted to devise any palliative measures. With reference to Mr. Náthábhái's remarks, Mr. Mead called his attention to a paragraph in the Administration Report where considerable stress was laid on the necessity of appointing traveling inspectors and vernacular classes on farms advocated. As soon as possible they would endeavour to institute such vernacular classes for instruction in specific points in agriculture. Instruction would be given in vernacular and in various stations, but, he thought, as at present advised, such instruction should not be of a general character. If, however, it was desired that vernacular instruction should be given with the view to create a class of general experts for the use of associations, then the matter required further consideration. He was not quite sure that it was possible. He had no particular remarks to make on the suggestions that had been made as to how associations should be formed. It was perfectly clear that the general trend of opinion was to go down to the lowest possible units as Dr. Mann pointed out. He did not think there could be any doubt about it. He thought that after all the Sangamner Taluka Association, for instance, would find that it was little more than a Village Association. All that he really wanted the central associations to do, was to send in English the representations from the villages. His office could not deal with vernacular representations. If they received a collective representation from several villages, the matter assumed an importance which would warrant his sending an officer to inquire. That was what he wanted. It seemed to him that it was purely a matter of organisation so far as the taluka or district associations were concerned. He only wanted them to voice the wants of the villages. He should like to see them create and stimulate as many Village Associations as possible and formulate their views.

Mr. B. P. Karandikar of Sátára said he found from experience that there was a genuine desire on the part of the cultivators themselves to have Agricultural Associations for agricultural purposes and that there were persons who were willing to co-operate with any sort of associations that might be formed and also with the Agricultural Department in their efforts to improve the agriculture of the Presidency. As a matter of fact, their desire was so intense that several of them had actually offered to place their farms at the disposal of the Agricultural Department for the purposes of demonstration. He moved that "this conference is of opinion that Agricultural Associations should be encouraged by Government and that adequate representation of village agricultural interests is essential to the success of any such associations, and in the opinion of this conference similar recognition might be given by Government to these bodies as it gives to the Village Sanitary Committees."

The Chairman suggested that Mr. Karandikar should omit the latter part of the resolution, as it was not desirable that they should be too precise at that stage of the discussion as to what line they should actually adopt. He might hope that when the next conference assembled and they got a little further ahead, they might be able to indicate with more precision the exact lines by which one association might be distinguished from another. He should like to express the satisfaction that the Government was likely to feel that there had been a cordial feeling manifested in this conference towards the establishment of Agricultural Associations. He hoped that the whole subject would be most vigorously and sympathetically treated by Government and that in the year to come they might see some substantial progress. He also sympathised with the views put forward by Dr. Mann that they should endeavour to appoint, if possible, some officer, whose special whole-time duty would be to keep in touch with such associations as might be formed. Whether they could do that or not owing to the smallness of their staff, must depend upon the extent to which the associations developed. If it were found that a fair number of associations were desirous of receiving advice, then he had no doubt that it would be necessary to appoint some special officer to look particularly after their interests and he hoped by that time they might have a man to spare.

Mr. Karandikar withdrew the latter part of his resolution, which, as it then stood, was carried.

In reference to the Chairman's invitation to the members to make any general suggestions on other subjects :

Mr. Raoji B. Patel suggested that some arrangement should be made with the B. B. & C. I. Railway for the provision of a cold storage car for the conveyance of skimmed milk to Bombay from certain parts of India, particularly Kaira. He said that owing to caste prejudice that existed among the people of Gujarát against skimmed milk produced by machine, and in the absence of transport arrangements to send it down to Bombay, the owners of dairies were obliged to throw it away. He thought that if the railway company provided the facility in the direction he had indicated a great impetus would be given to what promised to be a profitable industry.

Mr. Jáni said that it was difficult and dangerous to export skimmed milk.

Professor J. B. Knight doubted that the industry in question had much chance of being developed, in view of the fact that the dairies in Gujarát were conducted under most insanitary conditions. He described the dairy conditions obtaining in Nadiád. He said that Bombay Gaolies had begun to realize their folly of selling their dry buffaloes to butchers and were importing good bulls. Their efforts in this direction would be helped considerably if means were found to lessen the dry periods. In Europe and America these periods have been reduced to a minimum by means of careful breeding.

The Chairman thought the matter was certainly worth a vigorous effort if they could get cold storage cars to send milk down to Bombay. He assured Mr. Patel of his sympathy in the matter and it was his intention to look into it and to see what could be done. The railway company, he was sure, would not be unreasonable if it found that it could run such cars with profit.

Mr. J. A. Mollison said his chief objection was this that the whole trade in butter-making connected with Gujarát was carried on under absolutely insanitary conditions. He thought before they made any move for cold storage transport they should improve the sanitary condition of the dairies in Gujarát.

Mr. A. K. Leslie said Bombay badly needed good milk, and he thought it would not be impossible to send down milk to Bombay in good condition and without separating the cream by arranging for sterilizing plants somewhere near the places where the milk was produced. The subject was then dropped.

Mr. Náthábhái then expressed his view that farmyard manure was getting scarce and unless artificial manures were introduced tobacco cultivation in Kaira would deteriorate.

Mr. Main said that artificial manures were being tried on the Nadiád farm.

Mr. Ráojíbhái Patel described how he had successfully used a Sodium Nitrate solution as a substitute for the saltish water of tobacco wells. He further said that in England it was cheaper to use artificial manures and the same thing would take place if artificial manures were imported in large quantities. He suggested keeping a stock of Sodium Nitrate at Government farms for sale to cultivators. In a year or two the question would be settled whether there was or was not a demand for such manures.

Mr. Karandiker quoted *Mr. Várad's* experience of salt mixed with groundnut seed and suggested that refuse salt mixed with night-soil (to prevent its being used for human consumption) should be sold by Government and Railway concessions given for its transport.

Mr. Gándábhái Indarji said that the distribution of cotton in Gujarát was one of the most important steps towards the improvement of cotton. It was there that degeneration had begun and there regeneration must begin. It was not possible for the cultivator to obtain best seed. That was possible for them when hand-ginning was in vogue but in these days of factory ginning the cultivator was helpless because all sorts of cottons—good or bad—were mixed up and ginned at the factory. It was from the stock that he got his seed. Even if the cultivators were to try to get their own seed the factories would not gin the 2 to 20 maunds (80 to 800 lbs.) of best cotton—the minimum and the maximum quantities required by them. It was therefore necessary that some one should go to their help. Government had very graciously been doing that of late years and the results were very encouraging. On the first occasion cultivators rather hesitated and had to be persuaded to take the seed. But on the second occasion there was a rush and the demand far exceeded the supply. Obviously it was not possible for Government to enter into a commercial enterprise and to supply the full demand of seed. That was the field for the Ahmedabad Mill-Owners' and other Associations to come forward and to buy the best kind of cotton, to get it separately ginned and to sell to the cultivators that stock of seed on their own account, or to make arrangements with the Baniyas to sell seed separately. It would then be possible for Government to advertise and to advise the people to buy that particular seed. He further added that if it was not possible for the Ahmedabad Mill-Owners' Association to enter into the enterprise there was no lack of capital in Ahmedabad and a Kapas Company could easily be formed whose sole duty would be to supply the above need. Unless some similar course was adopted no amount of preaching—teaching, demonstrating or associating—would bring about the desired results which all so eagerly wished for.

The Chairman asked whether it would be possible to get the best cotton and whether the cultivators knew about it.

Mr. Gándábhái Indarji replied that both the things were possible and that the mixing was done not by the cultivators but by the Baniyas at the factories. If the cultivators knew about the arrangement to get pure cotton seed they would particularly keep their best cotton separate.

The Chairman inquired if the selection was to be field to field selection and *Mr. Gándábhái* replied in the affirmative.

Mr. Haribhái Gopálji stated on behalf of the Jalálpur Agricultural Association that that body was willing to supply as much Navsári cotton seed as was required by Government provided Government gave them the agency.

The Chairman asked what they meant by agency.

Mr. Haribhái explained that if Government gave the Association an order for Navsári cotton seed required by Government they would supply the seed at the prevailing market rates and also arrange to supply the public.

Mr. Jáni said it was very kind of the association to take upon themselves the difficult task of selecting seed. The mill-owners should hold cotton exhibitions every year. Then they would be able to find out what districts and what villages produced superior cottons. The department would take advice from the mill-owners as to what seed should be distributed.

Mr. P. J. Mead said that the question as to how far salt acted as manure would be investigated but he believed that it acted mainly as an insecticide in the case of groundnut though it was well known to be generally beneficial to crop like asparagus which had a maritime origin.

The Chairman, in closing the conference, again expressed his gratification at such a large attendance. They had received a number of very useful suggestions, which, he trusted, they would be able to turn to practical advantage, and give a satisfactory account of their stewardship at the next conference, which would be held in some other centre.

On the motion of *Mr. Chinubhái Mádhavlál*, seconded by *Sirdár Ráo Bahádur Kápúswámi V. Mudliar*, a hearty vote of thanks was accorded to the Chairman and the proceedings terminated.

APPENDIX I.

COTTON.

Work on this subject has been conducted at all Stations except Dohad where no experimental work has yet been commenced.

(a) Cotton breeding.

Practical results have now been obtained in the production of an improved variety for the Surtee Broach tract; the three crosses numbered 1027-A, 1338 and 1339 have maintained their superiority over the local kind for the past three seasons and showed now no variation. They have been produced respectively by crossing Kumpta with Goghári, Broach with Broach and Kumpta with Kumpta.

It should here be noted that 1027-A is not so white as the ordinary variety but this is no defect in itself though it may create some prejudice against it at first in the mind of dealers owing to the fact that Indian cottons are as a rule quite white. In spite of its colour Messrs. Ralli Brothers value it at 5 per cent. above Navsári cotton which itself carries a value of 6 or 7 per cent. above that of the best cotton we can grow at our Station. In other words the cross in question is superior to the ordinary variety *when grown under the same conditions by about 12 per cent.*

Since the same variety is grown over the whole of the Surtee Broach tract and the improvement in quality as we proceed south from Broach itself to Navsári (south of Surat) is due only to conditions of soil and climate, this cross can be grown with perfect safety over the whole of the tract. It is therefore only a matter of time and the raising of the necessary amount of seed, for a 10 to 12 per cent. improvement to be produced in the quality of cotton from the Surtee Broach tract as a whole.

When the cross has thus extended the increased value of the cotton crop from this area will not be less than 40 lakhs of rupees per annum.

Further it may be stated without risk of error that the improvement already produced is by no means the end of things and I am convinced that almost the whole of the Surtee Broach tract should produce in good seasons cotton superior to Middling American.

The crosses 1338 and 1339 though lacking the staple of 1027-A surpass it in colour, being quite white. With proper treatment these two crosses also should improve considerably.

In addition to these crosses the produce of a single plant from the ordinary crop grown at the Surat Station that I selected three seasons ago yields cotton valued at some 4 per cent. above the ordinary crop.

It may be mentioned in passing that the cotton produced at the Surat Station is not of so high a quality as that produced in the neighbourhood. As however all the samples examined had been grown within a few yards of one another they are strictly comparable. Messrs. Ralli Brothers valued the cross 1027-A at Rs. 12 per candy (say 4½ per cent.) above the best Navsári, *i. e.*, above the best cotton grown in a restricted area that has deservedly the very highest reputation in the whole Surtee Broach tract for staple and this although the local variety grown alongside the cross was judged to be of the same quality as that grown in the worst portion of the whole tract. If this cross were grown at Navsári it follows from the facts given above that the produce would be at least 12 per cent. better than Navsári cotton, already greatly superior to that of the Surtee Broach tract as a whole.

Though not actually yet forming part of the breeding operations at the Surat Station, an extremely promising variety which I have introduced from Cambodia may be mentioned here. It is interesting to note that this variety, which is a native of Indo-China, is identical botanically with the Upland* cotton of America and is undoubtedly the original source of that crop having been introduced there in 1753. The point of practical importance from our point of view is, however, not its botanical nature but the fact that while giving a produce very similar to Middling American in its general style, and classed in Liverpool as "Fully Middling" it will grow well on the black cotton soil of the Surtee Broach plain and this the introduced American will not do. I consider that this variety under proper treatment will form an extremely valuable asset in the experiments of the Department. It appears to be subject to none of the weaknesses and delicacy of its highly-bred descendant, the American plant, which, having been raised for a special set of conditions in America is unsuited to conditions in most other portions of the globe. There is no apparent reason why the breeding of this variety for the special conditions obtaining in parts of India should not lead to an improvement comparable with that which has resulted from the introduction of this same variety into America.

This variety is the only one that can at all compare in vigour of growth and general robustness on the Surat black cotton soil with the local variety out of all the very many varieties tried, it might even be said, out of all the varieties in existence, since I have grown at Surat a collection of the cottons of the World which is probably complete. This collection primarily made for the purposes of a monograph on the subject, now in the press,

* Universally but erroneously called *Gossypium hirsutum*, Linn. (et. Mill.); its correct designation is *G. trilobatum*, Lam.

has proved of great practical value. For, in addition to the above-mentioned variety from Cambodia, certain Persian cottons appear to be very suitable for crossing with Broach and other varieties of this Presidency.

With regard to the crosses at Dhárwár it can only be said that the Station is too new to have yielded a fixed type and that all the crosses in which American—either newly imported or from the stock introduced in 1829 and now grown as a field crop in certain parts of the district—figures as a parent have proved disappointing and this too, whether the other parent has been American or indigenous except only in the case of American + Sea Island and American + Egyptian crosses which appear to be promising; there will however be some difficulty in fixing a cross between varieties so distinct.

A cross between Bourbon (tree) cotton and Egyptian is also very promising but is yet only in the second generation.

As for attempts to improve the indigenous (Kumpta) variety these have, as in all other cases, taken two directions, namely selection alone and crossing. Selection alone appears to promise well. Of crosses the first was produced only last year and nothing definite can therefore be said about it. There is however no reason to doubt that results comparable with those obtained at Surat will ensue here also.

Crosses with Kumpta were made in the season of 1905-06 but the monsoon failed and the work was thus retarded. The crosses with American were produced at Poona and transferred to Dhárwár. This accounts for the fact that no cross very likely to produce results has so far been secured on this Station, though crosses with Kumpta appear to promise well.

With regard to the crosses at Dhulia which are intended for the improvement of Khándesh cotton little can be said except that they are also disappointing. They were all made at Poona in 1901 but had for the most part the long stapled herbaceum varieties of Gujarát and Southern Marátha Country for one of the parents. This, I think, is a mistake, the resulting cross being too late to mature within the growing period at Dhulia.

I have therefore commenced experiments with a view to ascertaining the rules, if any, that apply to the way in which the various characters of the two parents appear or disappear in the off-spring. Definite rules are now known to be followed in the case of many plants, *e. g.*, wheat, but so far as experiment has yet gone many of the characters in the case of cotton appear to be complex and some difficulty will probably be experienced in this case.

(b) *Distribution of selected cotton seed.*

In the year under report some 30 tons of seed of the Lálío variety, selected by the Department, was distributed in the Ahmadabad District. This distribution was especially welcome to the cultivators owing to a scarcity of seed following on last year's poor crop.

In certain parts of the Dhárwár District that are favoured with early rains, the demand for Broach seed introduced by the Department is considerable. The Broach variety is probably the parent of the local Southern Marátha Country variety (Kumpta) which now differs from it somewhat in the character of the cotton but chiefly in having a ginning outturn of only 25 per cent. as compared with the 33 per cent. of the Broach variety. The latter, when grown in the selected parts of the Dhárwár District, gives a heavier yield of seed cotton than the Kumpta variety and this seed cotton contains much more cotton and therefore, since the qualities are not very different, sells at a better price; for instance at Dhárwár when Kumpta sells at Rs. 112 per 1,344 lbs. of seed cotton, Broach (Dhárwár grown) sells at Rs. 132. The growth of Broach must, however, be restricted to those parts of the Dhárwár District which receive early rains, since it must be sown in July (the Kumpta variety is sown in September). These parts consist mainly of the talukas of (1) Dhárwár, (2) Hubli, (3) Bankápur, (4) black soil area of Ránebennur, and (5) portion of Ron where early rains are sure.

It appears improbable that even in these selected talukas the Broach variety will uphold its ginning percentage, but periodical consignments of seed from Gujarát can be imported. The ginning outturn, it may be mentioned, depends in any one variety very largely on the water-supply and increases within limits as this supply increases. The rainfall received by cotton planted in July is less in the Dhárwár District than the amount ordinarily received by cotton at Surat; hence the higher percentage in the latter district.

During the year under report (1906-07) some 800 lbs. of Broach seed was distributed in the Dhárwár District and for the coming season (1907-98) some 2,500 lbs.

It should be noted that this is not the case of distribution of the so-called selected seed but is really a substitution of one variety for another.

With regard to the question of selecting seed in large quantities from cultivators' fields, I have several times put on record my opinion that little good can result from this except possibly in cases where the tracts put under two different varieties join and where in consequence the seed of these two varieties becomes mixed at the gin; such cases are to be found in the Dhárwár District where Dhárwár-American and Kumpta are grown in close

proximity to one another and again in the Ahmedabad District where the same statement applies to the Lálío and Wágad varieties. Even in these cases the cultivator can do the selection equally well with, and much more cheaply than, this Department.

The only method of inducing a real improvement in the existing variety of a district by selection alone, is to examine and secure seed from individual plants that show superiority in either yield or quality of cotton. This is already being done so far as the existing staff will allow but the quantity selected annually must from the nature of the work remain small.

(c) *Investigation of Khándesh Cotton.*

This work is necessarily confined to the Dhulia Station. The investigation of this cotton is, I consider, one of the most important lines of work of the Agricultural Department. The mixture of varieties grown—all of which differ botanically from those producing the best cotton of the Presidency, *viz.*, Surtee-Broach and Dhárwár (both Kumpta and saw-ginned)—produces the bulk of the Indian cotton being grown over an area of 12½ million acres, *i. e.*, about 70 per cent. of the total area under cotton in India. Though the quality of the produce depends to a certain extent on its place of growth, whether in the Bombay Deccan, Central Provinces, United Provinces, Punjab or Sind, I have proved in my Note on the "Cottons of the Bombay Presidency" that the quality depends principally on the proportion in which the different varieties occur in the mixture. Further investigation confirms the conclusions drawn in the above-mentioned Note. The first point to gain in attacking the question was to isolate the various varieties, grow these separately and compare the yields and quality of the produce. This is a matter that cannot be disposed of in one season especially with the abnormal monsoons now prevalent and on a newly established Station. A beginning on definite lines has however been made and these are indicated below.

The six chief components of the Khándesh mixture we may call:—

Name of type.	Character of plant.	Botanical name.
1 Jari A	Narrow-lobed leaves	1 <i>G. Neglectum vera.</i>
2 Jari B	Broad " "	2 " " " <i>Malvensis.</i>
3 Jari C	Do. " "	3 " " " <i>Kathiawarensis.</i>
4 Bani	Do. " "	4 <i>G. indicum.</i>
5 Varádi A	Narrow " "	5 <i>G. neglectum rosea.</i>
6 Varádi B	Broad " "	6 " " " <i>Cutchica.</i>

In the year under report a small area was sown with each of these varieties, the seed of each having been picked separately from marked plants in the previous season in fields growing the mixture. The details are given below:—

Name of type.	Average per acre.		Percentage of cotton in seed cotton.
	Number of plants.	Yield of seed cotton.	
1 Jari A	1,190	Lbs. 30	31.6
2 Jari B	200	1½	25.6
3 Jari C	5,190	90	28.5
4 Bani	190	1½	24.2
5 Varádi A	12,850	310	38.7
6 Varádi B	14,320	420	35.7

Nos. 2, 3 and 4 are doubtfully distinct botanically; they produce cotton worth about 3 per cent. more than the rest.

It is apparent therefore that it is the variety giving the highest ginning outturn that gives also the cotton of the least value while the yield per plant of these varieties is greater than in the others. Further it is this same variety that in certain tracts, where the cultivators are noted for progressiveness, is specially selected from the mixture by the cultivators for seed purposes. The reason for this is that in the first place this variety is easier to pick and the season during which picking lasts is shorter, while the yield is good and the higher ginning outturn combined with the cleanness of the cotton may more than counterbalance its lack of staple so far as the price of seed cotton is concerned.

It is thus obvious that there are many conflicting qualities and interests to be taken into account in attempts to improve this, or indeed any, cotton but in the case of Khándesh cotton the difficulties would appear to be more numerous than in other cases. Again the short stapled rough cotton (Varádi A) that is most popular with the cultivator is largely used for mixing with wool for which purpose roughness is an advantage and it appears to be a question whether, in attempts to increase the cultivators' profits, it is advisable to aim at a softer and longer staple or at a still rougher but longer one. It would be safer to work separately in both these directions.

The crosses that have been so far produced on the Dhulia Station have already been treated of above.

APPENDIX II.

Note on Experimental Rubber Cultivation in the Bombay Presidency.

It is only within the last two years that the attention of the Department has been directed to the possibilities of growing various species of rubber on a commercial scale in the Bombay Presidency. With the exception of *Cryptostegia grandiflora* a naturalised species of African origin, this province does not appear to possess even one species of plant producing caoutchouc of profitable quality. The attention of the Department has therefore been directed to the naturalization of one Indian, one African and three American rubber producing plants.

1. *Cryptostegia grandiflora*.—A climbing plant, originally native of Africa and now widely naturalised in the dry parts of the Bombay Presidency, produces a rubber of excellent quality but in so small a quantity as to render it useless for the purposes of cultivation on a commercial scale.

From experiments conducted throughout the whole of one year it would appear that its yield of latex is at its maximum in September. The yield from individual plants is however so low that only villagers could make a profit by collecting it at times when they would be otherwise idle.

2. *Ficus elastica*.—*Assam India Rubber*.—The home of this plant is on low levels of the mountains of North India extending from Eastern Bengal to Burma. It is also said to be indigenous to Java. The chief requirements for the successful cultivation of this rubber are light, well drained land, and a hot steamy climate with a rainfall of not less than 70 inches well distributed over, say, 8 or 9 months in the year. The chief objection to the culture of this tree is that it at least must grow from 15 to 25 years before it is in a fit state for tapping, which process has to be very carefully performed, as decay rapidly sets up in the plant if the wood is wounded. The tree after 50 years is said to give an annual yield of 5 lbs. of rubber.

Unless in perhaps N. Canara district the cultivation of this tree can never be seriously taken up except as a Government enterprise and as it will probably be demonstrated that a quickly growing American species will succeed just as well in that district the serious attempt to grow it on a large scale will probably never even be initiated.

An analysis of the rubber produced by a plant in Poona shows that the product is, if any thing, superior to what is collected in Assam itself; but as has been already stated the long period required for the development of the tree and its special necessities in the way of soil and climate will effectually prevent its introduction on a large scale.

3. African rubber plants are usually climbers belonging to the order Apocynaceæ, but the best known species is, however, a tree called *Funtumia elastica*.

Experiments which we have been conducting on young plants of this species for the last 3 years prove that it is of extremely slow growth. In its wild state it is said to yield rubber when about 6 years old. From results obtained in Southern India and Ceylon it would appear that the plants give only a small quantity of rubber of inferior quality. Our knowledge of it in the Bombay Presidency is so meagre that we cannot even pretend to predict the results; but it would probably not repay cultivation.

4. *Ceara Rubber*.—This is derived from a small tree called *Manihot Glaziovii* which is originally a native of Brazil.

This is the one rubber plant which seems to readily adjust itself to diverse conditions of climate and soil. In India it is grown everywhere from the extreme south northwards to the lower slopes of the outer Himalayas. In the south it can exist from the level of the sea up to an elevation of 4,000 feet and it thrives under rainfalls varying from 30 to 200 inches and temperatures of 45 to 110 degrees F.

At Poona we have had specimens under cultivation for the last 10 or 12 years on ordinary soil without irrigation. The plants have attained normal dimensions under the circumstances and the rubber produced by them has been reported on in favourable terms. Plants of one year old at Bassein in sandy soil with a rainfall of 68 inches and in Poona in medium black soil under rainfall of 25 inches have attained an average height of 15 and 10 feet, and girth 7 and 12 inches respectively.

If the seeds are sown at the beginning of the rains or if young plants are put out at the same period, by the beginning of the cold weather, the plants are in a fit state to look after themselves. Irrigation is distinctly harmful and unless the land is thoroughly well drained the plants are apt to suffer during long spells of rainy weather such as we had this (1906-07) year. When it is thoroughly established no amount of drought seems to do it injury. It arrives at a tapping age when the stem has a girth of 20 inches which usually occurs from the 4th to the 7th year.

Tapping has to be very carefully performed as the plant is apt to die when carelessly treated. There is a strong prejudice against it on this account but now its peculiarities are understood and a more careful style of tapping has been devised the plant seem to be

gaining in reputation. The rubber coagulates readily without any special treatment, a fair quantity is yielded and the product in many ways is almost equal to that of Para which is considered the best in the market. As it seems to give the best results in dry districts it is practically the only species known to us at present which would thrive over the greater part of the Bombay Presidency. Seeds have been distributed to many districts and in two or three years we may be able to give a more definite report. The Forest Department is also making experiments independently of this Department.

5. *Castilloa* or *Panama Rubber*.—This is obtained from a tree called *Castilloa elastica*, a native of Central America. It is said to be distributed through a wider range of latitude than any other rubber producing plant and has also been known longer to Science than any other rubber plant, having been first described in 1794.

In their native home these plants prosper more especially in the dense moisture saturated forests of Central America. In the producing districts par excellence of this rubber, namely, in the basin of the Rio San Juan, it rains nearly 9 months in the year and this climatic condition is essential to a perfect growth and development of the *Castilloa*.

In Ceylon it is said to grow best where the minimum temperature is never below 60 degrees F. and in districts with well distributed rainfall of 50 to 80 inches. Some plants are said to attain the height of 30 feet and a girth of 20 inches when only 3 years old.

Our experiences with the cultivation of this tree have been unsatisfactory. It absolutely refuses to grow at all in the Deccan—a result which could have been surmised on a consideration of its climatic requirements. In Bombay a few indifferently good specimens can be seen in the Victoria Gardens and at Bassein plants of one year old have only attained the height of 2 feet. Plants put out in Belgaum by Colonel Wyllie grew luxuriantly in the first year and their cultivation may be ultimately successful as the climate of this locality almost fulfils the plant's requirements. In Ceylon the yield of rubber is said to be poor and it seems to require manipulation to bring it into a marketable state. The prospects of the successful cultivation of this tree are not encouraging.

6. *Para Rubber*.—This is obtained from a tree called *Hevea braziliensis*, a native of the Amazon valley. The climate of its native home is said to be fairly uniform, the temperature ranging from 74 to 95 degrees F. and the rainfall from 80 to 120 inches. The trees are said to attain a height of 90 feet in 30 years and they are first tapped when the girth is 20 to 24 inches. The rubber realises the highest value in the market.

The cultivation of this tree does not seem to be advisable beyond a few degrees on either side of the equator. It refuses to grow in the Deccan and plants at Bassein and Konkan only attained the height of nearly 3 feet in one year.

The only part of the Bombay Presidency where its cultivation may be at all promising is N. Canara where experiments have already been commenced by the Forest Department.

To sum up: the only rubber plant which is worth growing under general conditions in the Bombay Presidency is Ceara, and *Cryptostegia* may yield a little revenue, serving as an adjunct to village resources.

G. A. GAMMIE,
Economic Botanist.

APPENDIX III.

A short Account of Rubber in Ka'nara.

In 1906 orders were received to start experiments with the three species, *Hevea*, *Castilloa* and Ceara. Seeds were obtained from Ceylon during the monsoon months and put down in three selected localities: two below the Ghâts in the Honávar and Kárwár Tálukas; one above the Ghâts at Yellápur. The sites selected were Gairsappa at the foot of the Ghâts in the evergreen jungles or close to them in the Honávar Táluka and a place called Bargadde in the Kárwár Táluka, where water was available and the soil was judged to be favourable. The former of these sites is a good one, the latter turned out to be quite unsuitable because of the consistency of the soil which was too heavy and tenacious; the site has since been abandoned in favour of another close to the river Kalinaddi at the village of Kadra. As far as can be judged, the place chosen for the seed-beds and nursery at Yellápur was not a very good one, being in an exposed situation in very dry and rather inferior soil.

The first lot of *Castilloa* (the first seeds obtained) was distributed to the three places above mentioned in the month of July, but, owing to delay in the journey from Ceylon and afterwards in getting it to its destination, the percentage of germinations was very low. In the chief place, Gairsappa, very heavy rain followed immediately upon the sowing and washed away the seed-beds with most of the seeds, with the result that out of some 5,000 seeds only two plants were obtained. These two plants, however, are flourishing: going strong with an abundance of leaves and are now some 3 feet in height. From these two plants it may be judged that the species will thrive in the locality they are in. In Yellápur,

the germinations were somewhat more favourable: out of 1,800 seeds 87 plants were obtained and these are reported to have an average height of 1½ feet and to be doing well. In Bargadde no seeds germinated.

Hevea seed arrived in the month of August, the great bulk being sent down to Gairsappa: 13,000 out of a total of 15,000. 1,000 each were sent to Bargadde and Yellápur. The great majority of these seeds was undoubtedly bad and the result of the sowing was consequently very meagre. Gairsappa had 229 germinations; both the other places produced none. Nearly all the Para plants have lived on up to the present date and show no sign of dying; they have all been transplanted from the nursery into the plantation where, after a few days of indifferent growth, they have lately shown renewed vigour. For six days they were under flood-water and this is probably the cause for a somewhat retarded height-growth. Their height is now on an average 4 feet. Para will probably succeed well enough.

In the month of September Ceara seed was put down, all having been first filed. The percentage of successes in this species was also not large. Out of 3,000 seed there were only 250 germinations at Gairsappa and most of these plants are still existing. They are flourishing, have been transplanted into the plantation and are over 12 feet in height. At Yellápur 4,000 seed yielded 739 germinations and 518 plants are now present: these are 9 feet in height and said to be doing well. Bargadde yielded a percentage somewhat smaller than Yellápur, the plants were attacked twice by locusts and finally removed to Kadra where they are doing well. Ceara is a hardy species and will certainly succeed in Kánara.

Having gained some experience from these partial failures, the orders of Government were asked to start anew again this year with larger numbers of seed. Four times the amount of seed was therefore obtained from Ceylon and put down in Gairsappa, Kadra and Yellápur. 50,000 Para, 20,000 Castilloa and 40,000 Ceara were indented for, proper arrangements were made for the journey and their receipt on arrival, and the distribution to Kadra and Yellápur and everything was ready for putting the seed down immediately it came. Castilloa was received in June, Para and Ceara in September. In the case of Gairsappa and Yellápur nurseries the sowing was supervised throughtout by the D. F. Officers themselves; this was not possible in Kadra where it had to be left to subordinates. The germinations in Gairsappa of Para and Castilloa are over 90 per cent., those of Ceara will probably be as good: it is still going on, as rapidly and successfully from the unfiled seeds as from those that were filed. The successes in Kadra were about 55 per cent.; owing to some carelessness on the part of subordinates it did not reach a higher figure. In Yellápur 10,000 seeds resulted in 3,000 plants for Castilloa and 5,000 Para seed yielded 3,000: successes of only 30 per cent. in each case. All the Castilloa in Gairsappa were under flood-water from the river for six days in August (they were planted in June) but suffered no damage therefrom; in Kadra the same thing happened and a goodly number of plants died. The water rose to an extraordinary height in the rivers this year: the rise in the Shiravati amounted to 47 feet.

It is now two months since the Para was put down this year and five months since the Castilloa was sown. All the plants are doing splendidly and the average height of the Castilloa is about a foot and a half, of the Para a foot, and the Ceara about the same.

T. R. BELL,

Kárwár, 23rd November 1907.

Divisional Forest Officer, W. D., Kánara.

APPENDIX IV.

Questions, Suggestions and Answers.

1. *Question* :—How can this Department assist in establishing closer relations between producers and wholesale dealers?

Prima facie it is particularly desirable in the case of any improved varieties introduced by this Department (*cf.* ground-nut) to secure adequate prices for such improved produce at once. The view has been expressed that Government should not enter into competition even in cases where early encouragement of producers is essential. The system of a central market organised by Government has met with a considerable measure of success in the case of the Egyptian cotton in Sind. Is any extension of this system desirable in the case of any other crops?

Suggestions.

Mr. Chinubhai Mádhavlát of Ahmedabad.—Suggests museums of samples of new varieties of cotton, where dealers will have "free access not only to the samples of various products but also to full and

✓ *Answer.*

1. The suggestion that samples of new products should be collected at central places and information given as regards the localities where these crops are grown and a rough estimate of yield presents no

authentic information about the habitat of the producers and also the extent of their produce." He approves of central markets and thinks that the chief merit of this system is the certainty the cotton mills, as consumers of a steady reliable quality of cotton, must have in these markets where the chances of adulteration of inferior or foreign stuff are reduced to a minimum.

The Agricultural Association, Dhárwár.—Disapproves of a central market at Dhárwár. Broach and Kumta varieties of cotton are quite similar in seed and plants except in the higher percentage of lint of Broach and the central market will induce illiterate cultivators to mix the two varieties and defraud the wholesale dealer.

They suggest that the places where the Broach cotton is cultivated and the extent of produce should be notified for the information of dealers. The producers should also be made acquainted with the "real higher" value of their produce.

The Bombay Chamber of Commerce.—Think that "producers and dealers might be brought into touch with each other by notifying some central place in Bombay, and perhaps in one or two other large towns, where samples of all new and improved products might be sent for inspection and sale. Merchants and traders should be informed of such arrivals by advertisements in both the English and Vernacular Press; and notices should also be sent to the surrounding Police Thánas. Further, whenever cotton is available in merchantable quantities Government should send samples and state quantity available for sale, to the Cotton Trade Association and the Mill-owners' Association; and the Chamber of Commerce and the Grain Merchants' Association should from time to time be advised about other produce.

"My Committee do not understand the allusion to Government competition but they consider that in the initiatory stages when official encouragement of producers is essential, it is very advisable that Government should take a vigorous lead in opening up trade and placing new commodities on the market.

"It is suggested that Collectors of districts should be circularised by the Agricultural Department, with a view to ascertaining how new and experimental crops are progressing in their respective districts."

The Karachi Chamber of Commerce.—The producer "is usually in the hands of the Bania from whom he has to borrow money in order to raise crops on his land and consequently the largest share of his crops goes into the hands of the Banias. The first aim therefore must be to ensure the financial independence of the cultivators and to attain this Agricultural Banks will help a great deal."

insuperable difficulties and an attempt will be made to make arrangements this year for the exhibition of samples of foreign ground-nuts in Bombay. As regards cotton I do not think the Department can promise more at present than the exhibition of samples of any improved varieties. The arrangements for a central market at Mirpurkhás for the Jamrao Egyptian cotton have been again sanctioned by Government for this year: it may be noted that last year's central market did not prevent zamindárs from making their own terms with cotton agents where they preferred that course. The application of this system to other crops must, I venture to think, depend on the ability of smaller landholders to get in touch themselves with outside buyers. The most effective link is undoubtedly a co-operative association for the collective disposal of produce but the view that co-operative credit must in India precede co-operative distribution is strongly held by many competent observers. The former demands less business capacity and by loosening the Banias' hold on their clients paves the way for operations of the latter kind. The conditions of the fruit and vegetable trade between various centres and Bombay are at present under investigation. *Prima facie* there appears to be considerable scope for a better distributing agency than exists at present in many places and possibly a commencement under Government guidance may lead to the establishment of small co-operative societies in the future. Agricultural Associations might help considerably by careful inquiry and report on the conditions obtaining in their part of the country. ✓

The Chamber's Committee "are in entire agreement with the view expressed that Government should not enter into competition as prices will very soon be regulated according to the value of produce and the laws of supply and demand. They consider that the Institution by which produce is to be auctioned under Government control on fixed dates is not always advisable, nor does it ensure the producer obtaining a higher price for his produce; once the value of the produce becomes approximately known, the producer is bound to get a fair rate from the different wholesale dealers who will be competing to secure it. Auctions on fixed dates especially for an article like cotton the price of which has of late years undergone great fluctuations from day to day, will more often than not militate against the producer securing the full value of his produce, in as much as the wholesale dealer being obliged to wait for the auction may miss the opportunity of buying on a day on which he is in a position to offer an advantageous rate."

Nadiad Agricultural Association.—Central markets are desirable where any new crops are grown to a large extent. They propose that Government should buy at a high price even small quantities of any new crops by way of encouragement.

Mr. Mangaldds G. Parekh of Ahmedabad.—Central markets approved. A permanent museum of Agricultural implements and produce should be established in each important city in Gujarát. The museums are to run on lines similar to those suggested by Mr. Chinubháí.

2. *Question:*—To what extent should we rely on Vernacular newspapers for the dissemination of agricultural information?

Suggestions.

The Agricultural Association, Dhárwad.—Vernacular papers should not be relied upon to any extent. They suggest that a free monthly Department publication to which amateur experimenters should contribute should be supplied free to those cultivators who would apply for it.

The Nadiad Agricultural Association.—New successful experiments or new methods (of cultivation) should be published through vernacular papers, as "cultivators are now-a-days taking much interest in reading agricultural literature published in vernacular newspapers."

Mr. R. P. Karandikar of Sátára.—Vernacular newspapers will be useful. But itinerary lecturers should be appointed to inspect sowing operations, &c. Sátára District Association is willing to help.

Answer.

2. The difficulties in the way of providing competent lecturers have frequently been set forth: they will certainly be provided as soon as men are available. Meanwhile the procedure sanctioned by Government to which reference has been made in para. 74 of this year's Administration Report may be tried and the suggestions now received will be considered in developing this line of work.

The Thakore Sahib of Amod.—Vernacular papers do not reach small villages. Agricultural information must be mainly disseminated through Departmental Agency. Suggests that lessons on agriculture may be inserted in vernacular reading books.

Mr. G. V. Joshi of Poona.—The most important Agricultural publications should be rendered into vernacular and made available to the people and the village school master for some additional remuneration should read the pamphlets to assembled ryots.

The Bombay Chamber of Commerce.—Vernacular papers should be encouraged to publish general information referring to local agricultural subjects. For this purpose qualified native writers should write short articles on improvements and new products.

The Karachi Chamber of Commerce.—Dissemination of Agricultural information through vernacular papers will not show any important results "owing to the fact that the majority of the agricultural population in India is illiterate."

Mr. Mangaldas G. Parekh.—Well-to-do peasant proprietors take some interest in reading newspapers and through their medium and influence lower grades of cultivators would come to know of useful information.

3. *Question.*—Would Vernacular instruction to be given on certain selected Government Farms be popular and useful?

Suggestions.

Mr. Chinubhai Madhavlal of Ahmedabad.—Vernacular classes should be combined with concessions to experimenters in the shape of remission of assessment if their crops suffer from some accident during the experiment. The concession may be given during the first five years.

The Dhárvár Agricultural Association.—Are in favour of Agricultural classes with a two years' course and students selected from the sons of cultivators of large holdings.

The Nadiád Agricultural Association.—Suggest one year's course for cultivators. Provision should be made for 10 students with free lodging and free boarding or Rs. 10 scholarship. Instructions should be given in (1) Oil engine and pump, (2) well boring apparatus, (3) Dairy, (4) Tobacco curing, (5) cultivation of all crops in the Presidency, and (6) other Agricultural matters.

Mr. E. P. Karandikar of Sátára.—Agricultural Farms should be established in a central locality in every taluka. Well-to-do landholders may place their plots temporarily at the disposal of the Agricultural Department for experiment.

Answer.

3. Perhaps some of these suggestions are too ambitious. For the present at any rate it is clear that we can give instruction on specific points on our own stations long before we can carry instruction to the villages through the medium of qualified lecturers. I would lay particular stress on the necessity for specific instruction, *e. g.*, the selection of seed in any way not commonly practised at present in any tract or the cultivation of a new crop. I do not think that a general course in Agriculture will serve any useful purpose. Specific instruction plus demonstration which may extend over a few months is the line of work I had in view. An experiment is about to be made by Mr. B. A. Dalál in this direction.

The Thakore Sahab of Amod.—Vernacular instructions should be given on Taluka Farms.

Mr. G. V. Joshi of Poona.—(1) Certified and expert Agricultural lecturers two for each agricultural Division, viz., Sind, Gujarát, Deccan, Karnatak and Konkan on an adequate salary of Rs. 200 a month should travel over their divisions giving instructions to the cultivators. (2) 30-40 acres in each village should be selected, the Department of Agriculture should supply seed and manure gratis and the cultivator should be left to do the rest of the work under instructions of the Department.

The Bombay Chamber of Commerce.—Vernacular instruction should be given at the farms. Itinerant lecturers should give lectures on market days with samples of produce.

The Karáchi Chamber of Commerce.—Vernacular instructions on Government Farm will not be popular. Selected pupils should be instructed on the farms and should afterwards be taken into Government service as instructors to other cultivators.

4. *Question*:—The uses of Agricultural Associations ?

Suggestions.

Mr. Chinubhai Mádhavádl.—Agricultural Association will be of great use and will do much good "if coupled with experimenting cultivators."

Dhárwár Agricultural Association.—The occasional meetings will ensure interchange of ideas and successful new crops and new implements will be popularized in much shorter time than by the Agricultural Department unaided. (They cite an instance in the introduction of the English plough through the Association).

Mr. R. P. Karandikar of Sátára.—Agricultural Associations or Co-operative Societies should look to (1) extention of private irrigation works, (2) help needy cultivators, (3) keep Agricultural implements to lend, (4) stop bone export, and (5) prevent misuse of Tagai as at present.

The Thakore Sahab of Amod.—"Cultivators will be unwilling to go to any distant place for Agricultural Association Meetings."

✓ *Mr. G. V. Joshi of Poona.*—Sketches out a scheme for (1) Communal Committees, (2) District Agricultural Association, (3) Divisional Agricultural Association, and (4) Superior Council of Agriculture.

(1) *Communal Committees.*—Every village of considerable size should have an Agricultural Council of its own consisting

Answer.

4. From the Department's point of view we may perhaps welcome the evolution of any association which is fairly representative of the agriculturists of the tract. Practical inquiries and information should be the first fruits of such associations. The Department will give any advice it can but it will also ask for information and assistance in demonstration. Experiments should be left to the Department's stations. Meetings of members and discussions are not likely to bear much fruit at present. What is required is a medium for communication with the cultivators of the tract represented. Big landholders can approach the Department direct as they do at present but an association which took the trouble to represent the wants of the smaller cultivators and supply information would do useful work. It is impossible for the Department to send experts to investigate all individual problems but if an association can make out a case for the investigation of a fairly widely prevailing set of conditions, the Department will probably be able to make inquiries and suggest a general remedy.

of 5 or 7 representative agriculturists, appointed by Government or nominated by the free choice of cultivators, the Pátíl to be *ex-officio* member and the Kulkarni or school master *ex-officio* secretary. Mr. Joshi estimates that ultimately there might be 4,000 such panchayats.

The functions of the panchayat should be prescribed by law. It should control village forests, páts (irrigation channels), demonstration farms, stock breeding, library, store of seeds, Tagái advances, and help the poor agriculturists by grant of seed and manure, &c., and rewards for specially good cultivation.

An agricultural fund should be formed of:—

	lákhs.
(a) An annual grant from provincial revenues (1 p. c. of land revenue)	3
(b) An annual grant from Local Boards (1 pie of the Local fund cess)	1½
(c) An annual grant from Municipalities	½
(d) Annual donations, &c.	—
Total	5

The District and Divisional Associations and the Superior council of Agriculture should be the several steps above the village panchayats.

The Bombay Chamber of Commerce.—The starting of Native Agricultural Associations will be premature.

The Karachi Chamber of Commerce.—Agricultural Associations properly instituted will be useful.

Mr. Mangaldas G. Parekh.—Agricultural Association should be kept in touch with Government through permanent museums.

5. QUESTION:—The uses of Agricultural shows and the lines on which they should be organised?

Suggestions.

Mr. Chinubhai Mádhavlal of Ahmedabad.—Approves shows and suggests substantial prizes for best exhibits; cottons to be shown in parcels of 25-50 bales and large prizes like 500—1,000 Rs. awarded to large consignments of high grade cotton.

Dhárwár Agricultural Association.—Agricultural shows are difficult and expensive at new places but they should be added to the existing cattle fairs.

Nadiád Agricultural Association.—Agricultural shows will not be so very useful. Permanent museums should be established at the farms, which should be free for inspection of cultivators, and the exhibits at

Answers.

5. The suggestions will be considered. The view put forward by the Chamber of Commerce is undoubtedly sound. Inspection of our Agricultural stations is always encouraged and is probably more useful than any show in places where there is no station. But financial considerations must limit the reduplication of large experimental stations, and annual shows at a few big centres organized with special reference to the cultivation of the surrounding tract should, I think, continue to find a place in our work. I agree that Associations can and should help us. An attempt is now being made to collect a nucleus of permanent exhibits for such shows. Some of the cotton exhibits at

which should be explained to visitors. Prizes should be given for best exhibits.

Mr. R. P. Karandikar of Sátara.—District and Taluka Associations aided with Government money will make the shows successful.

The Thákore Sáheb of Amód.—Agricultural shows should be extended to every Taluka town.

✓ *The Bombay Chamber of Commerce.*—Agricultural shows should exhibit Government Farm products and offer prizes for outside growers. The products exhibited should have attached a concise description explaining how, when and where, they are grown, the yield per acre, &c.

✓ "The District shows should, when possible, be held in conjunction with the local village fairs and near to the Experimental Farms so that visitors to the Show and Fair could be invited to inspect the farms, and be shown round by a member of the staff qualified to explain the details of the various experiments to them."

Mr. Mangaládas G. Párek of Ahmed-abad.—Shows approved. Funds should be collected and prizes awarded for the best and largest quantity of cotton. Bangolare museum and experimental farms in Mysore should be taken as specimen.

the last Surat Exhibition will be shown in the room in which the Conference is to be held and the catalogues distributed at Surat will also be open to inspection. Further suggestions may perhaps be elicited at the Conference.

6. QUESTION :—Transport of garden and vegetable produce.

Suggestions.

The Bombay Chamber of Commerce.—Ask for facilities over railways for transport of garden and vegetable produce.

The Karáchi Chamber of Commerce.—A system of light railways as in Egypt should be constructed.

Answer.

Information is being collected from the principal Railway Companies and any replies received in time will be laid before the Conference. (*Vide Appendix V.*)

General Suggestions.

7. *Nadiád Agricultural Association.*—Suggest (1) Cultivation of beet at the Nadiád Farm for extracting sugar.

(1) A similar inquiry was made in 1901 when Mr. Mollison gave the following opinion :—

"The ordinary beet grown in India and used as vegetable is a different crop altogether. Experience in Europe shows that the development of sugar in sugar beet is determined to a certain extent by climatic conditions."

Dr. Watt has also expressed the opinion that "India is precluded from ever becoming a beet sugar producing country."

(2) Sending a trained subordinate to foreign countries to learn the process of curing tobacco.

(2) The suggestion of "sending a subordinate to foreign countries to learn the process of curing tobacco" is premature as was explained at the last Conference.

(3) Small area should be allotted to the demonstration of fruit culture at the farms.

(3) The question of fruit culture is under consideration.

(4) Aloe should be planted as hedges on the farm to demonstrate the cultivation and use of this cheap fibre plant.

(5) Government grants-in-aid may be given to private experimental Farms as are given to private schools.

(6) Suggest that cotton seed distribution in Gujarát may be continued.

(4) Aloes require good soil, water and moderate shelter. Mr. Gammie will give any further information that may be required but we do not propose to plant such aloe fences on our experimental stations.

(5) I cannot recommend this.

(6) The question is under consideration and I should be grateful for any specific information that members can give me as regards the present practice in tracts with which they are acquainted. Selected cotton seed is sold at present by some merchants.

8. *Mr. R. P. Karandikar of Sátára.*—

(1) Decrease of cattle is regrettable and should be prevented either by a change of policy in the forest conservancy or prohibition of slaughter of useful cattle.

(2) More fuel required to obviate necessity of cattle dung being used as fuel.

(3) Mr. Wárad's experience of salt mixed with groundnut-seed on the proportion of 1 to 3 (practice common in the Bársi Táluka) quoted. Refuse of salt mixed with night-soil (to prevent its being used for human purposes) should be sold by Government and Railway concessions given for its transport.

(4) Manure distributing Machines advocated.

(5) The Agricultural Department should make timely purchase of good seed at the instalment time and make seed available to needy cultivators in every village.

(1) So far as my information goes neither forest conservancy nor sales to butchers have caused any appreciable loss of valuable working cattle. Compared with the effect of rinderpest and other contagious diseases, other causes sink into insignificance.

(3) Mr. Knight will reply on this suggestion.

(4) The cost and weight of such machines as manure spreaders are prohibitive in India.

(5) The question is under consideration. This is a line of work which Agricultural Associations might well take up.

9. *The Thákore of A'mod.*—Suggests pure cotton seed should be provided by the Department.

Vide answer to 7 (6) above.

10. *Mr. G. V. Joshi of Poona.*—(1) Suggests the establishment of "regional" schools of Agricultural Divisions and of a central library and a Bureau of Agricultural Intelligence in Poona. He wants the following:—

Cattle.

(2) Village forests established and more and cheaper grazing allowed in State reserved forests.

(3) Stud bulls should be purchased at a cost of Rs. 30 to 40 thousand and distributed free.

(1) The suggestion is premature surely.

(2) This is hardly a fit subject for discussion here or as general question.

(3) I should be glad to know where precisely there is any want of bull power.

Manure Supply.

(4) Soil-mixing—the silt of rivers, &c., should be analysed and where beneficial used as manure.

(5) Suitable embankments to fields should be made.

(6) Larger area of leguminous crops should be grown.

(7) To aid the State reserved forests, village fuel and fodder reserves and private forest plantations should be encouraged.

(8) Export of oil-seeds should be prevented by establishing oil-mills.

(9) Export trade in bones should be prohibited by law.

(10) Artificial fertilizers should be sold at reduced rates.

(11) Encouragement should be given to *pātasthal* irrigation by

(a) Engineering advice as to eligible sites;

(b) Boards of Arbitration to decide water rights; and

(c) Loans for constructing pukka bāndhāras.

(12) The Department of Agricultural Forests and Irrigation should be under the control of one Department.

(4) and (5) Both these suggestions are under consideration.

(6) This is receiving considerable attention at the hands of Mr. Henderson in Sind.

(7) *Vide* remark against 10 (2) above.

(8) I do not understand what action this Department is to take.

(9) The necessity of a cheap supply of sulphuric acid before any extended use can be made of bones as manure has already been pointed out.

(10) Experiments are being carried out both on our own stations and on private lands with such manures. The necessity for their supply at reduced rates is not apparent.

(11) (a) is under consideration, (c) is already provided for and (b) is a moot point which frequently comes under consideration in various shapes.

(12) This is beyond the scope of an Agricultural Conference.

11. *The Karachi Chamber of Commerce.*—The cultivators should be advised not to sow mixed crops especially such crops as cotton and castor oil plants.

11. The practice will be noted.

APPENDIX V.

Transport of Garden and Vegetable Produce.

On the G. I. P. Line garden and vegetable produce is carried (a) by passenger trains in specially constructed vans (plan of the van placed on the table), and (b) by goods train in ordinary waggons. The greater part of the produce traffic is despatched to the Bombay market from stations as far as Bhusával on the north-east line and Dhond on the south-east line. Potatoes from Mahábleshtar, Nilgiris and Saugor Districts and oranges from Nágpur are also received.

The produce is usually conveyed by goods train, but when the time taken by these trains does not allow of delivery in the market in due time it is conveyed by passenger train at goods rates. The rates charged are 2nd class goods rates at owner's risk and 3rd class at Railway risk. But for certain articles in which there is large traffic waggon rates are charged according to following scale:—

For distances up to 100 miles	...	Rs.	0	5	0	
" 250 "	...	"	0	4	0	per waggon.
" 600 "	...	"	0	3	0	per mile.
Above 600 miles	...	"	0	2	6	

There is also considerable traffic in plantains, bananas, apples, &c. These are usually carried by passenger train at half parcels rate. Oranges are also largely despatched from Nágpur at half parcels rates. Plantains and oranges are also carried by goods train at the above rates.

In cases where waggon rates are not quoted the charges are on the actual weight of the consignments tendered. It is open to cultivators to combine and obtain the conditions of waggon rates where quoted.

The matter of quick transit has received the attention of the Company and where it is shown that the carriage by goods train is not quick enough, the traffic is carried by passenger train. These arrangements will be continued where the traffic and conditions require them.

As regards the provision of cold storage vans, this Company has so far not constructed any such vans, as there has been no demand for them; but the Company is prepared to consider the matter if any such demand arises.

On the B. B. & C. I. Railway the traffic in garden and vegetable produce is not very heavy and is carried by passenger trains in road vans. No special vans have been built for the purpose. The traffic is carried at specially reduced rates.

The Agent of the company further writes: "As most of this class of traffic is for short distances and as north of Ahmadabad, the climatic conditions are not conducive to the growth of this kind, except in the cold weather, when no special arrangements for carriage are required, it has not been necessary to provide cold storage. In the cold season a certain quantity of vegetables is consigned from places like Ajmeer and Jaipur to the Bombay Market. A large quantity of plantains is also booked from our local stations Bassein Road, Nalla Sopara, Virár and Pálghar, which is carried by goods trains, generally at night and reach Bombay in time for the early morning market. For the latter produce special rates are charged as follows:—

1 to 100 miles	Rs.	0	4	6	per waggon per mile.
10 to 200 "	"	0	3	6	" "
Over 200 "	"	0	2	6	" "

The Company would be glad to assist in promoting the growth of the traffic.

On the Southern Mahratta Railway, garden and vegetable produce is carried as parcels traffic by passenger trains, the traffic not warranting the provision of a particular type of van. The Company appears to be willing to experiment with cold storage vans at Bangalore and Belgaum if cultivators are induced to consign in van loads; but they are not prepared to reduce the freight charges. The least charge they would make for hauling a cold storage van holding about 50 maunds by passenger trains, would amount to Rs. 25 for 100 miles. This is exactly the amount required to send 50 maunds over 100 miles under the existing traffic.

The appended statement compares the rates obtaining on the three railways. Of the three railways the G. I. P. Railway has done the most to help such traffic. The van rates quoted by the B. B. & C. I. Railway are somewhat cheaper, but they are only quoted for one article, *viz.*, plantains. Presumably they would also be allowed for any vegetables consigned in van loads. The goods rates quoted by the G. I. P. Railway are the cheapest for

smaller consignments than van loads. The following will show how the different rates work on the different lines.

A waggon load of plaintains from Surat to Bombay, 167 miles, at $4\frac{1}{2}$ annas per mile for the first 100 miles and at $3\frac{1}{2}$ annas per mile for the remaining 67 miles will cost Rs. 42-12-6. A waggon load of plaintains from Dhond to Bombay (167 miles) at the rate of 4 annas per mile over 100 miles and under 250 miles will cost Rs. 41-12-0. The Southern Mahratta Railway charges at the rate of 14 annas a maund for this distance are Rs. 43-12-0 for 50 maunds. At 4 annas a mile a specially constructed waggon holding 50 maunds would apparently be hauled for Rs. 41-12-0. At present therefore there is little inducement to send large consignments by railway, but considerable attention is being paid to the traffic in small consignments.

Again for smaller consignments, say, of 10 maunds the charges from Dhond at the special rates would be Rs. 4-11-10 at the owner's risk and Rs. 6-3-5 at the Company's risk. On the B. B. & C. I. line there is no such provision for long distances. A 10 maund consignment sent from Surat will be charged at the vegetable parcels rate at 8 annas per maund and would cost Rs. 5.

Rate for fruit and vegetable Parcels.

Miles.	Rate per maund.				Special rates.	
	B. B. & C. I. Ry. (Broad gauge.)		G. I. P. & S. M. Railways.		Second class goods rates at owner's risk.	Third class goods rates at Company's risk.
	Rs.	as.	Rs.	as.		
1 to 25	0	2 $\frac{1}{2}$	0	2		
25 to 50	0	3 $\frac{1}{2}$	0	4		
51 to 75	}	0	}	0	6	* $\frac{1}{2}$ pie per mile.
75 to 100				0	8	* $\frac{3}{4}$ pie per mile.
101 to 125	}	0	}	0	10	5 annas 10 pies per 100 mile.
126 to 150				0	12		6 annas 3 pies per 100 miles
151 to 175	}	0	}	0	14	
176 to 200				0	8	
201 to 250	0	10	1	0		
251 to 300	0	12	1	0		
301 to 325	}	0	}	1	2	
326 to 350				1	4	
351 to 375	}	1	}	1	6	
376 to 400				1	0	
401 to 450	1	8		

* With 8 pies for terminal charges.

PROCEEDINGS

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OF THE

AGRICULTURAL CONFERENCE

HELD AT

P O O N A

ON THE

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29th and 30th September and 2nd October 1909.



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PROCEEDINGS
OF THE
AGRICULTURAL CONFERENCE, 1909.

Present :

His Excellency Brevet Colonel The Hon'ble Sir George Sydenham Clarke,
G.O.M.G., G.C.I.E. (R.E. retired). (In the chair.)

The Hon'ble Sir J. W. P. Muir
Mackenzie, K.C.S.I., M.R.A.C.,
I. C. S., J. P., Member of Council.

The Hon'ble Mr. J. L. Jenkins,
C.S.I., M. A. (Oxon.), I. C. S.,
J. P., Member of Council.

His Highness the Mahárája Sir Sayajirao of Baroda, G.C.S.I.

His Highness the Mahárája Sir Shahu
Chhatrapati of Kolhápur, G.C.S.I.,
G.C.V.O.

His Highness the Mahárája Sir Pratapsingh Bahádur of Idar,
G.C.S.I., K.C.B., A.-D.-C.

A large number of Chiefs, Jahágirdárs and Sárdárs of the Deccan.

The Inspector-General of Agriculture and many officers of the Agricultural, Revenue and Forest Departments.

Representatives of the Bombay Chamber of Commerce, the Millowners' Associations of Bombay and Ahmedabad and many agricultural associations.

About 300 landed proprietors and gentlemen interested in agriculture, drawn from every district in the Presidency Proper.

PROCEEDINGS.

1st Day of the Conference, September 29th.

In opening the Conference His Excellency the Governor said,—In India, it is not easy to say anything that will not be disputed or criticised; but the two propositions which I wish to lay before you should command universal acceptance, even though their import is imperfectly recognised. In the first place, agriculture is and must remain by far the most important of all Indian industries and the essential basis of India's prosperity. In the second place, Indian agriculture, allowing for climatic vagaries, is in a distinctly backward position. Production is not what it might become, and waste in many forms is rampant in many places.

The provision of an adequate food-supply is a primary condition of the existence of mankind, and the great growth of population in India, which has accompanied British rule and which is still proceeding, entails more and more demands upon the land. I do not know whether the prevailing high prices, which have been advantageous to the cultivators in many cases, but which bear hardly on the town dwellers, are due in part at least to a growing disproportion between the population and the production of food-stuffs, or whether they arise from other and temporary causes. Investigation may throw some light on this important question; but the inexorable facts remain that 290 millions of people in India must be fed, that the food-supply will have to be increased as the years go on, and that a point may be reached at which the growth of other staples will have to be checked unless the production of the necessities of life can be increased.

EXPORT TRADE.

This may become a problem for the whole world before another century has passed. It is doubtful whether the food-supply is keeping pace with the steady growth of population, and an unfortunate coincidence of bad crops in

many localities would already create a serious shortage. Some great countries have ceased to be able to feed themselves. In the British Islands, this stage was reached many years ago, and in 1907 they imported grain and flour alone to the value of nearly $75\frac{1}{2}$ millions sterling, and meat costing nearly 52 millions. Germany is becoming more and more dependent upon imported food. The United States, once great exporters, are dropping out of the wheat market and may have to trust in the future to Canada, where great fertile tracts have not yet felt the plough. In Eastern countries, the Chinese and the Japanese, being excellent cultivators, probably extract nearly full value from their soils, and the home demands of the latter are increasing. India not only feeds herself, except in such an important item as sugar, but derives a large source of income from the produce of the land. It is supremely important that this position should be maintained, and that while continuing to feed her people and endeavouring to reduce the imports of staples that can be grown on her soil she should not lose her export trade.

How important that trade is I wish to explain. You have perhaps been told that before the advent of British rule, India had an immense trade, which has since disappeared. I am sure you understand, however, that the trade of those halcyon days was a bagatelle in value compared with that which India now enjoys. Excluding Government stores, India exported merchandize to the amount of about $115\frac{1}{2}$ millions sterling in 1907-1908. This was a record year both for exports and imports, and in 1908-1909 the former fell to about $99\frac{3}{4}$ millions owing to a deficiency of crops. Now the point which I want you to remember is that of these $99\frac{3}{4}$ millions, very nearly 73 millions were paid to India for the produce of the land. It may well be that you do not realize this important aspect of agriculture from which the Deccan does not largely profit; but it needs no imagination to grasp the fact that the realization of nearly 73 millions sterling in an indifferent year must have an immensely beneficial effect upon the economics of India as a whole. And this benefit is derived wholly from agriculture.

ENCOURAGING INDUSTRIES.

Much has been written about the need for the promotion of industries, which, it has been stated, Government desires to check. I need not tell you that such statements are baseless. Government is doing all it can to encourage industries; but, if I have made my meaning clear, you will understand that a sudden expansion of manufacturing industries on a large scale would be disadvantageous. There is already shortage of labour in some localities, and the population in this Presidency is not at present capable of supplying a large additional surplus to work in factories without depleting the numbers required for the vital necessities of agriculture and for great public works. The food-supply must be maintained and will have to be increased; the foreign trade derived from the land must not be lost. The density of population in some parts of India is greater than with us; but even in these parts a rapid transfer of large numbers of country dwellers to town life, such as has happened in industrialized countries, would be an evil, since the restrictions and regulations to which European town dwellers submit would be bitterly resented by the people. In the United States, the dwellers in towns numbered 3 per cent. of the population after the Civil War. Forty years later 33 per cent. were living in cities of over 8,000 people. In England and Wales, the town population increased from 50 per cent. to 77 per cent. in fifty years. If far less changes than these took place in India, the effects would be serious, and the factory colony outside the city, of which the Poona Paper Mills supply a good example, points to a way of avoiding the evils of over-crowding.

Meanwhile factory industries as a whole continue to develop by a process of natural evolution, subject to the fluctuations which affect all countries. Cotton mills have increased from 74 in 1883-1884 to 227 in 1907-1908, and Jute mills from 23 to 50 in the same period. Spindles have increased in far higher proportion. Statements as to the decay of trade and industry are refuted by the smallest study of the facts.

THE HANDLOOM TRADE.

In India, as in all countries, the character of trade and of industries has changed; but the growth of both is remarkable, and it is steady advance, especially in the latter which affect the social life of the people that we must seek to promote. A very useful line of manufacturing progress for this Presidency at the present time is to be sought in the encouragement of hand industries, such as weaving, which would not only bring prosperity to an hereditary class, but might enable the earnings of the cultivator to be increased. The Government recently appointed Mr. Mehta to survey the handloom industry and from the useful report which he has prepared I gather that this branch of work is capable of development on the two conditions of improved methods and co-operative agencies. In the production of Eri silk also, which is being urged by a Government expert, there is a possible opening for easy and profitable labour for women and children.

I have endeavoured to show the vital importance of the products of the land in regard to the feeding of the people and to the export trade. If you turn to the import trade, the one great item indicating a deficiency of production is sugar, the value of the imports of which reached the record figure of $7\frac{1}{4}$ millions sterling in 1908-1909. I have no doubt that this figure can be reduced, and Government by its great irrigation works and by giving financial assistance to sugarcane growers is doing all in its power to increase the production of this important food-staple. Meanwhile you, as thinking people, will readily understand that to boycott foreign sugar can only inflict hardship on the poor and promote a particularly despicable kind of fraud. From the economic point of view the step is useless because the high profits of sugarcane growing in this Presidency suffice to stimulate its development. The political object which, as recently defined in a letter to the "London Times" by a high Indian authority, is to "draw the attention of the British public" to the partition of Bengal is obviously futile in the case of sugar, since the total abolition of the imports would not affect that public in the slightest degree and would fall mainly upon the Asiatic cultivators of Java and Mauritius, and in a less degree upon the beet growers of central Europe.

ANTIQUATED METHODS.

The old saying, that the greatest of benefactors is the man who can make two blades of grass grow where one grew before, applies with peculiar force to India, and the best service which could be rendered to the country at the present time is to increase agricultural production. For various reasons the greatest of Indian industries is backward in many respects. Methods are antiquated and inadequate even where the conditions of rainfall or of irrigation are favourable. The average wheat product of England is 32 bushels per acre. In the Bombay Presidency it is 21 bushels on irrigated and 8 bushels on unirrigated land. In parts of the Deccan, weeds run riot in the fields, and the cultivator may be seen sowing his crop among them. There are even places where the land has been abandoned to weeds which grow strongest in the best soil, and cultivation is thus driven to soil of inferior quality. Even in a year of good rainfall like the present, the aggregate production will not approach what is possible. The tillage of the land is insufficient and the selection of seed is not understood. The uses of manure are little appreciated and night-soil, which is a source of large profit to the Japanese, is unutilized. The breeding of stock is mainly left to chance, with the necessary result of deterioration and waste. Healthy and diseased animals intermingle with consequent, but preventible loss.

In such conditions as these, the improvement of the land which has been a marked feature in Japan is necessarily absent, and there is probably a growing infertility in many places. The Japanese, who rank amongst the best natural cultivators of the world, have the advantages of a good rainfall. Having been cut off from communication with the outer world for centuries, and possessing a soil naturally poor they have been thrown on their own resources. Cattle being exceedingly few, the land must be worked by hand, and the increasing

pressure of a population, which has risen from 27 $\frac{1}{4}$ millions in 1828 to 47 $\frac{3}{4}$ millions in 1905, called forth the energies and the innate resourcefulness of the people, who make the utmost out of a fertility which their own labours have created, and who can afford to waste nothing. As Sir F. Nicholson justly states in an interesting report: "Tillage and manure, strenuous spade labour and the utilization of all waste are the main secrets of Japanese husbandry." In spite of the heavy burden of taxation which in the case of agricultural land, was suddenly increased by 120 per cent. to meet the requirements of the Russian War, the Japanese cultivator holds his own. And now that the pressure of population continues to increase while the cultivable area cannot be expanded, he is showing the wonderful adaptability of his race by quickly adopting the new methods which science can indicate.

TO HELP THE CULTIVATOR.

This important Conference has been assembled in the hope of doing something to help the cultivator and to advance the general prosperity, which, as I have tried to point out, depends mainly on him. The science of agriculture is of modern growth; but already immense strides have been made, under its auspices, in western countries. I am most anxious that the benefits should be extended to India which stands in the greatest need of them. It is natural and right that you should expect help and guidance from Government in these matters and the Agricultural Department, which owes so much to my honourable colleague Sir J. Muir Mackenzie, is a proof that we recognize our responsibilities. It is a new department and it is a baby in comparison with the giant organization maintained in the United States; but if you read the annual report, as I trust you all will do, you will see that valuable work—educational, experimental and demonstrational—is already in progress.

I hope that the members of this Conference will take the opportunity of visiting the college, farms and gardens in the neighbourhood, and will see for themselves what Government is trying to accomplish for the good of the people. We want you to give and to receive advice, and our officers are ready now and always to discuss agricultural matters and to distribute the special knowledge that they have acquired.

In the science of agriculture, a general solution of the many problems is rarely possible. Each may require a solution depending upon local conditions, local customs, and even local prejudices. The success of a process or of a plant in other countries does not guarantee success here, where it may be necessary to change the process, or to produce a special plant in order to suit the conditions of climate and soil requirement. The needs of the Deccan differ in many respects from those of Gujarát and of Sind. You will therefore see the importance of experiments scientifically carried out by a central body, and you may be able to give valuable assistance by communicating with the Department. I am glad to know that some of the Chiefs and Sardárs in the Presidency are actively interesting themselves in the improvement of agriculture, and I am sure that they will co-operate with us for the general good.

THE MAIN REQUIREMENTS.

The main requirements are capital, labour and knowledge; but, above all, knowledge, without which capital and labour would be wasted. Only a century ago there were large tracts in the Deccan which lay waste for years as the result of the devastations of armies and of depopulation. These tracts have been brought under cultivation; but the improving process, which in England and other countries has been brought about by a combination of labour and capital and in Japan mainly by highly intelligent labour alone, has been absent. While, therefore, there are many good and industrious cultivators, production has been disappointing, and there has been a series of indifferent years which might have caused despair among people less sturdy and less hopeful than the Mahrattas. Losses due to bad seasons lie beyond our power to prevent. All that Government can do is to extend irrigation, and you may be sure that we shall spare no effort and no argument.

to obtain sanction for the great Deccan projects now being elaborated. I allude especially to the Gokák and the Nira Right Bank schemes which will command respectively 490,000 and 700,000 acres, while the latter will safeguard the most famine-stricken districts of the Deccan. If these great works did not immediately earn the prescribed rate of interest, as I believe they would, the indirect benefits would be so immense as to demand their construction. Apart, however, from the extension of large irrigation works, there is much that could be done to reduce loss in bad seasons and to ensure a great increase of production when the rainfall is favourable. Our Jágghirdárs, Inámdars, landlords and substantial cultivators will find that it will pay well to apply capital to the improvement of their lands. Levelling and bunding, the erection of tás to prevent wash, fencing to protect the fields from the cattle and the cattle from the fields, the digging of wells to utilise subsoil water, the harnessing of nalás to catch surface water, the installation of pumping plants on river banks—these are some of the requirements and, if they are approached with knowledge, they will prove safe and profitable investments. Similarly in the use of manures, in the selection of seeds, in sowing where there is now much waste, and in improved tillage, there is ample scope for progress. The last annual report of the Agricultural Department points out that if jowari seed is treated with sulphate of copper, costing one anna an acre, there will often be “a profit of a hundredfold and more.” Here is a way in which the investment of capital on an insignificant scale will prove remunerative. As to investment on the larger scale, such as the purchase of iron ploughs and of pumping or cane-crushing plant, you will find some useful information in the report. Even in dry years, large sources of sorely needed water are wasted for the want of power pumps.

PRACTICAL QUESTIONS.

The practical questions which confront us are “how can we bring the knowledge already available and certain to be increased year by year to bear upon the people, and how can the poor cultivators be helped in the matter of capital?” I earnestly hope that the members of this Conference will be able to give us valuable help and advice in solving these important questions.

We are anxious to increase the number of agricultural associations, and I am glad to note that ten such bodies were inaugurated during the past year, and that many Indian gentlemen are rendering great assistance. Each such association can be a centre from which practical information, such as is contained in the series of very useful publications, edited by Dr. Mann, can be disseminated. But more is wanted, and we require the active agency of local leaders who will supply initiative in agricultural matters and will show the people how they can improve their position. Similarly, we have an increasing number of co-operative societies, by means of which, with the aid of a bank, we hope that the benefits of financial combination and of the industrial organization which has worked wonders in other countries may be made manifest. In helping such bodies as these, there is a wide field of practical usefulness for the true patriots of the Presidency, who must realize that the uplifting of the cultivators is the greatest boon that could be conferred upon India.

APPEAL TO THE PRESS.

In this connection, I venture to make a strong appeal to the conductors of the Press, who could do much to help the people by spreading the knowledge that Government is anxious to provide. It is sad to note that in some quarters, vague denunciation, which cannot effect any practical good and may do some harm, seems to be mistaken for politics which have a far nobler meaning. Criticism based on facts I welcome; but if our friends, the critics, would devote some of their energies to the diffusion of knowledge of which the people stand in dire need, I am inclined to think that their criticism would be more effective, and that the progress of India towards nationhood would be more rapid.

I am afraid that I have detained you too long, and I will only say in conclusion that I hope that these conferences will be annual and that they will help in solving one of our greatest problems—the promotion of the welfare of the patient cultivators upon whom now and even more in the future the prosperity and progress of India must depend.

PROOF OF REAL INTEREST.

Now I have the honour and pleasure of declaring this Conference opened. I think the great gathering that I see before me is a distinct proof of the real interest that is being taken and felt in the problems of agriculture, and there are other sides all over the Presidency of this great question, which, if more developed, would be better for the people. You should remember one particular thing to which I have alluded in my address, I think with some emphasis, and that is what is really needed is self-help, and suggest directions in which it can help, but the initiative must come from the people themselves and the leaders in the country, who are in touch with the people and who know much about their wants, can render service which is considered of national value in all countries by promoting organizations of this kind. Considering the enormous benefit done to agriculture in some countries by such agricultural organizations one earnestly hopes to see in India gatherings, such as this as often as one can, and I am hopeful that a new impetus will be given to what will be greatest good to the people, who deserve so much at our hands and on whom the welfare of India so much depends.

His Highness the Mahārāja of Baroda then said:—Your Excellency, your Highnesses and gentlemen,—I do not at all understand why I should have been called upon to address you on this occasion. The only reason, that I can understand why I have been asked to speak by His Excellency, is that we have all been interested in the general question of agriculture. Whether one comes from a Native State or from any other part of India, one's interest is equal in this question. There is no other question of greater importance, at the present day, in Indian politics than the question of agriculture. Eighty per cent. of India's population lives on agriculture, and to improve their lot and to improve the yield of their lands is no mean task, and that Government is doing its best to help them as much as it can is a matter of great congratulation. I hope its labours will be crowned with success. His Excellency, in his admirable speech, has touched upon many questions of vital importance, and it would be useless for me to waste your time in referring to them in any detail. I have no doubt that those who take the utmost interest in those questions will pause and consider them after they have left this hall. There are, however, a few points, in His Excellency's speech, on which I should like to say a word or two. His Excellency laid great emphasis on the question of initiative on the part of the people. Well, gentlemen, no movement of a lasting nature can really succeed unless the people themselves take the initiative, and in India for many reasons we think of this as the greatest want. It is sometimes asked: "Have the people got natural intelligence?" My own belief is that the people of India are fairly intelligent, and if they are given opportunities of education and so on they will be able to hold their own and compare themselves favourably with any other people on the face of the earth. But, gentlemen, we must not feel simply proud of the people; they should, having got the natural ability, try to solve practical questions. I think the people should take the initiative in seeing that the knowledge of agriculture reaches every household and every farm. Primary education should be given to all the people concerned in this question; and if it is coupled with agricultural education they will be greatly benefited. Without that, I am afraid, the noble endeavours of Government may not succeed to that extent to which they are entitled. With these words, before I sit down, I will move a hearty vote of thanks to His Excellency for his excellent address.

His Excellency then left the Council Hall, after which The Honourable *Sir John Muir Mackenzie* occupied the chair and said:—Gentlemen,—I have not the smallest intention of inflicting on you a long address on this occasion. You have heard His Excellency's most eloquent address which affords plenty of

material for thought. I only want to give you some outlines of the course of business before the Conference. This Conference has far exceeded in dimension anything that we had expected,—I may say it has exceeded our most sanguine expectations. The Department of Agriculture and the Government welcome this large assembly which contains distinguished men and many representative cultivators and landlords. I have no doubt it is obvious to you that a large number of persons having signified their willingness and their desire to speak, it will be absolutely impossible for us to go through the subjects that have been put in the programme unless the speakers are selected to some extent and unless they confine their remarks within a reasonable compass. I propose, therefore, to fix the time for each subject, in the first instance. I wish to ask speakers, in any case, not to exceed ten minutes, and, if possible, to confine their remarks to five. Then I should like to say that if in spite of this self-imposed limit we are unable to go through our subjects today and tomorrow, then we shall be prepared to meet on Saturday. We have arranged for demonstrations on the farms, which, I think, will be of a greater utility and advantage to us than our meetings. I earnestly hope that a large bulk of this assembly will attend these demonstrations, which, I am perfectly convinced, will be very useful and interesting.

Before I sit down, gentlemen, and proceed to business, I should like to remind you that we have recently started a Central Agricultural Association, and anybody who desires to become its member has only to apply to one of its energetic Secretaries who will be glad to give him all the necessary information and to induce him to become a member, if possible. Gentlemen, the subject that will be first discussed here is the report of the Agricultural Department.

**QUESTIONS AND COMMENTS ARISING OUT OF THE REPORT
OF THE AGRICULTURAL DEPARTMENT WERE THEN INVITED.**

Mr. K. R. Godbole (of Poona) said :—I do not propose to take up the time of the Conference by making any comments or criticisms on the report of the Bombay Agricultural Department for 1908-1909 which has been kindly sent to us by the Director of Agriculture. It is a record of very useful work performed by the Department and by the Agricultural College. The point of special gratification to me in the record is the graduation of 28 young men in agriculture during the year under report. The number of such qualified men should fast increase, as they will greatly help in spreading agricultural education amongst the agriculturists in the Presidency. As the number of agriculture graduates increases some of them will take to farming as their profession and means of livelihood, and they will then naturally adopt improved and scientific methods in practical work which will probably shew much better results than are obtainable by the methods of untrained agriculturists. This practical work of our agricultural graduates will be an object lesson to their less educated brothers; and this lesson is bound to lead to advancement and prosperity.

I want to make a few remarks with regard to the work of the Agricultural Department in this Presidency. The first is with reference to irrigation wells. Canal irrigation is not practicable in many parts of the Deccan, Southern Marátha Country and Gujarát. In such tracts wells must be encouraged and their construction stimulated by all practicable means, as recommended by the Irrigation Commission. As regards funds, *tagái* advances are being given by the Revenue authorities. I understand from the report that charts are being prepared by the Agricultural Department, shewing the depths of subartesian water levels in different localities. The agriculturists want information also as regards the depths below ground level at which sufficient water from percolation and springs will be met with and the different strata which will have to be pierced through before the water level is reached. The charts under preparation should give this information also in as great detail as practicable, and the information should be placed within easy reach of agriculturists. During actual construction of wells the agriculturists find great difficulties and have to incur heavy expenditure in unwatering excavations, before re-commencing work on them. What I mean is this. Suppose a cultivator has excavated a well and has reached water level excavated

1 or 2 feet below it and wants to deepen another 6 or 7 feet, work is usually carried on in daytime only and not at night. Early each morning the water in the well has to be removed before excavation can go on. For this unwatering a staging has to be made and one or more *motes* with bullocks have to be employed. The unwatering often takes 4 hours and the time available for doing excavation work in the day is thus reduced to 5 hours only. This means loss of working time and great expense in bullock power. I think there will be considerable economy and saving in time in many cases if pumps are employed for unwatering. The pumps may be contractors' pumps, chain pumps or centrifugal pumps with an oil or steam engine. District Local Boards and selected Táluka Local Boards should keep stocks of suitable pumps and engines. They have trained establishments already. Agriculturists should have the use of these pumps, engines and establishment on payment of working expenses, cost of transport and perhaps a small additional charge to cover three and a half per cent. interest on capital expenditure. Similarly for blasting in rock in the case of Deccan wells dynamite should be made available by District Local Boards on payment of requisite expenses. Considering that the District Local Boards obtain their revenue almost exclusively from land, the additional work I would throw on them, will, I think, not be considered to be out of place.

The next point to which I would invite attention is the necessity of stores of selected and prepared seed. We know that there is practically no selection of seed at present amongst ordinary cultivators. When the sowing season is about to commence the agriculturist often goes to the local Bania for his seed supply, and the Bania gives any stock he happens to have in his shop. The report that has been laid before us shews that in portions of the Southern Marátha Country the profit per acre can be increased by Rs. 10 by sowing Broach in place of Kumta cotton, that in Surat and Dohad the yield per acre of *jawari* and maize was increased by 200 lbs. by using selected seed instead of bazar seed and that *jawari* seed treated with sulphate of copper increases the outturn largely. It is therefore a matter of great importance to place selected and prepared seed within the reach of cultivators. I would therefore advocate the establishment of selected seed stores in táluka towns. At these stores the seed stocks should be such as have been approved by agricultural experts, and they should be sold to *boná fide* cultivators at cost price including suitable charges for establishment and interest.

To the seed stores advocated by me I would add stores of suitable improved, agricultural implements and chemical and other manures in selected tálukas. The implements and manures should be sold to *boná fide* agriculturists at cost price which latter will include establishment and small interest charges.

The seed and implement and manure stores, I am referring to, should be financed and managed by táluka agricultural associations or private enterprise. When such agencies are not forthcoming, and when the agency for such stores is pressing, I would recommend their being started and worked in their initial stages by Táluka Local Boards.

The Honourable Ráo Bahádur S. K. Rodda (of Dhárvar) said:—Sir John Muir Mackenzie, Mahárájas and gentlemen,—Before I make any attempt to express my views on the value and utility of conferences of the nature held today in this grand hall under the auspices of His Excellency the Governor of Bombay, I beg to tender my heartfelt thanks to His Excellency and to Mr. Keatinge for their kind and cordial invitation which has been extended, not only to Poona but to all the remote districts of the Presidency, thereby extending the horizon of their sympathy to the remotest parts. This speaks for the keen interest evinced in the welfare of the agricultural population.

The objects with which conferences of this nature are held are manifold, and cannot be explained in detail in such a short time. Gentlemen, as a representative of landholders, I think, I am privileged to say a word or two on this occasion. In the first place, I think that one of the most important objects of this Conference is to obtain an exact idea of the true state of our agricultural industry in the Presidency. To get at this it is quite necessary that all that

feel interested in agriculture, be they the rayats themselves or be they men owning lands farmed out to rayats or liberal-minded gentlemen interested in the welfare of the agricultural classes which form the majority of the population of the country, should largely come forward to express their views, talk of their experiences, mention their difficulties, solve their doubts and, above all, get the best advice for the improvement of agriculture from the special officers of the department and from the teachers of the several subjects which are embodied in agriculture, who have made a life-long study of the subjects. Besides this, the practical demonstrations, etc., at the farms and laboratories will give all an insight into the use of new means and methods required for improvement and to the best advantage of all concerned in the land.

For this we have to very carefully observe how in our profession, as agriculturists, we are surpassed by others and why, and to devote our attention to the ways and means by which we shall be able to come to their level at least, if not to excel them. Therefore, gentlemen, with a view that our object may, to a certain extent, be realized, this Conference and conferences of a similar nature are arranged by the well-intentioned officers of the department. When a conference of this nature was suggested to our rayats they thought that Government were planning measures for increasing the assessment by trying to know the ins and outs of the cultivators. But the officers enlisted the sympathy of the non-official class, and the conferences proved successful and are certainly serving as useful institutions which form object lessons to the uneducated rayats and artizan classes in the vast field of agriculture.

Gentlemen, I am forced to admit that in spite of the help and sympathy we have been receiving at the hands of Government and the special officers under it, in spite of the co-operation of some of the best educated non-officials, the bulk of the people, who represent the agricultural classes, do not care to come forward and take advantage of the benefits of shows, conferences and demonstrations on the farms. It is peculiar to this class of men to be scared away from such public gatherings for some reason or other. Some are indifferent and some are afraid of approaching the Government officers. Besides, there is a class of persons who mysteriously nod their heads and whisper to their fellow-brethren to take care lest the Government should tax their lands heavily on account of their having exhibited a bumper crop or mentioned his own good way of cultivation with regard to some crop or other. Thus, many a rayat, for reasons known to himself, would rather stick to his home than have anything to do with such useful movements. Dear brethren, I have the honour of representing the rayat class and, as such, you have a full claim upon my confidence. I entreat you earnestly for your own sake and for the sake of your country, which you love so dearly, not to entertain such idle fears. Dispel all such ideas and try to visit such conferences, shows and exhibitions, in whatever places they may be held, as if they are sacred places of pilgrimage. If you do this, I am sure you will find that there will be much that could be seen and learnt therein, and all that will be to your greatest advantage. By coming to places like these you will see improved implements of husbandry, both of native manufacture and foreign importation.

Gentlemen, in conferences like this you will get in a short time a knowledge which you would not acquire by years of hard study. You will hear of the improved methods of cultivation, the kinds and uses of the manure, and the new inventions in machinery required for particular portions of field work.

Continuing, the speaker quoted figures showing that large profits were to be made from intensive agriculture conducted on advanced principles, and urged landowners to take the lead in introducing machinery for water-lifting, oil-crushing and sugarcane-crushing and similar purposes.

Mr. A. M. Bidikar (of Belgaum) expressed his opinion that lack of cattle was a great difficulty of the cultivators; that the number and quality of cattle had deteriorated during the past thirty years; and that the cause of this deterioration was the fact that many forest lands were now closed to grazing.

Mr. S. D. Navalkar (of Bombay) considered the report of the Agricultural Department to be, on the whole, a satisfactory one, and made the following suggestions :—

- (1) That facilities of the chemical analysis of soils and other substances should be provided on Government farms as well as in Poona.
- (2) That a model farm should be started in each táluka.
- (3) That agricultural and cattle shows should be encouraged.
- (4) That larger grazing areas should be set aside for the maintenance of work cattle and milch cattle.
- (5) That extended facilities should be given to cultivators to take leaves and branches from the forest areas for *ráb* and green manure.
- (6) That forest rules which drive people to use cowdung as fuel be relaxed.
- (7) That the export of bones be prohibited.
- (8) That every táluka should have its own Agricultural Association.
- (9) That gun licenses should be given freely for the protection of crops.

Mr. G. F. Keatinge, Director of Agriculture, agreed with the last two speakers that lack of agricultural cattle represented a great difficulty of the cultivators, and that lack of fodder was at the root of the matter. In connection with the proposals to provide grazing by throwing open the forests he pointed out the difficulties, stating that good grass would not grow on stony hills or under thick trees, but only on good open land; and that where such land was available far more fodder might be obtained by cultivating fodder crops than by leaving the land alone to grow grass. He expressed his opinion that in many localities the way to improvement lay in more extensive growing and careful storage of fodder; and offered the assistance of the Agricultural Department to any one who wishes to take up such work.

Mr. Paul Fredrichsen, Scientific Expert of the Potash Syndicate, Germany, emphasized the need of applying potash to the soil, and said, that though a soil might be rich in potash, that potash was often not in an available form, and could not be used by the plants. He believed that the application of potash would produce good results in the Bombay Presidency, and added that he was trying several experiments on cotton, jowári and tobacco.

Mr. R. L. Gharat, Honorary Secretary, Panvel Shetki Sabha, then said :— The three districts of Thána, Kolába and Ratnágiri are usually called the Konkan. As in other parts of India, agriculture is the chief occupation and source of maintenance of the population in the Konkan, more than 70 per cent. being agriculturists.

The cultivable lands are divided into bágayat (garden), kharif (rice), rabi (winter crop) and varkas (upland).

Cocoanuts and betel-nuts grown in the coast villages and towns are the principal garden products. Professor Knight who saw some of the best coconut and betel-nut gardens in the Alibág Táluka of the Kolába District in 1908 does not think any improvement is necessary in their cultivation, though in some cases it would be necessary to find out means whereby a better water-supply could be secured. A cheaper and better mode, like the oil engines and pump, for drawing the water out of the wells than with the *raháts* or Persian wheels or the *mot* worked by bullocks, is also desirable. The question of manuring the trees so as to make them give a better yield even in poor soils may also engage the attention of the Department of Agriculture. Fish, cowdung and oil cakes are the only manures now used, but as they cannot be had in sufficient quantities, some other cheaper manure has to be thought of.

Rice is the staple product and food in the Thána and Kolába Districts occupying more than 60 per cent. of the tillage area. The different methods of cultivating rice are nearly the same in all the three districts, and as they are well known or may be easily known by referring to the Bombay Gazetteer Volumes X, XI and XIII, they are not described here. In course of time it may be possible for the Department of Agriculture to suggest improvement in

these methods with a view to economise both labour and money by the employment of improved tools. Of late years it is found that the rice lands have not been yielding as much as they did in years gone by. The Agricultural Commission appointed by the Kolába Zilla Sabha prepared a set of questions, asking information on various points from land-holders and cultivators. The answers to one of the questions show that the productive capacity of the rice-growing lands in the Kolába District, has deteriorated 25 per cent. more or less. Various causes have been given for this deterioration, chief among them being (i) insufficient *ráb* and manure in consequence of forest regulations, (ii) defective rainfall, (iii) insufficient and unhealthy cattle, (iv) insect pests, (v) poverty and consequent heedlessness of cultivators and (vi) high prices, scarcity and plague.

There can be no doubt that the natural elements of fertility in these lands have now been exhausted, and the cultivators have no means of restoring them by manuring. This year's rainfall is the most useful and the best distributed we have had for several years, and yet some of the late crops in the so called best lands of the Alibág and Panvel Tálukas have not fared well. It is observed that where rubbish or some other manure is used, the transplanted seedlings have thriven well. At present *ráb*, oil cakes, dry fish and sheep-folding are used only for the growth of rice seedlings to be prepared for transplantation, the fields in which they are transplanted getting no manure whatever. It seems necessary that some kind of manure should be used for these fields at least once in three or four years. No doubt they have their turns of getting some manure when seedlings are prepared on them, but such turns are few and far between.

Dr. Mann and Professor Knight have both been carrying on experiments as to the utility of *ráb* in the preparation of the seed bed for rice. Dr. Mann's report on this subject which he promises to publish at the end of the present rice season will be awaited with no little interest. Professor Knight's contention that fish manure, nitre, oil cakes, sheep-folding and cowdung ploughed in are as efficient as *ráb* is not disputed. The Konkan Agriculturists know the fact already and have been using these substitutes for years, but the main question with them is how and where to find fish, nitre, oil cakes and sheep-folding in sufficient quantities within their limited means. Dried fish in the coast villages is largely purchased by traders of the Deccan at very high prices. Oil cakes cannot be had in sufficient quantities in the Konkan, and it is a question whether they can be ordered from upcountry at a reasonable cost. Some sweet oil cakes from upcountry sold in the Konkan bazárs are used to feed cattle. Nitre as a manure is unknown to the Konkan cultivator, while sheep-folding is not less costly than *ráb* in the Konkan, the shepherds bringing down their sheep to the Konkan villages all the way from the Deccan with a view to make good profit. If the cultivators could get these manures in sufficient quantities they would utilize them in fertilizing the exhausted fields. It seems that *ráb* is destined to continue as a fertilizer for some years to come, and until the time it can be dispensed with, facilities for procuring materials for it will have to be given to the cultivators. Cowdung ploughed in will certainly give better results than cowdung burnt, but cultivators burn it to prevent the profuse growth of weeds with the seedlings that is seen when cowdung is ploughed in. The weeds do not allow the seedlings to thrive, and their removal is found to be a troublesome and expensive job. Perhaps cowdung mixed with earth and other cheaper substances may form valuable manure for fields in which the rice seedlings are transplanted, but all the cowdung goes to make the *ráb*. The Department of Agriculture will place the Konkan cultivators under great obligations by recommending manures for rice fields that can be easily obtained. When Professor Knight visited the Alibág Táluka, he found that the people were neglecting to make proper use of cattle urine. He advocated the ways of utilizing it, and some cultivators have already begun to profit by his advice, but it will be some time before the general body of cultivators can be made to realize how a small but easily obtainable manure was allowed to go to waste. His second suggestion was that dry leaves which were burnt with the *ráb* should be ploughed in and allowed to rot in the fields after the crops had been gathered. The rotten

leaves would be a very good manure for the exhausted fields, but it is not possible to give effect to this suggestion as there is very little moisture left in the fields after the harvesting of crops. As an alternative it seems possible to dig large pits, fill them with alternate layers of dry leaves and of earth, so that they may rot during the rains and be a useful manure for rice fields, the next season. It is also possible to fill pits with green plants and weeds with a mixture of earth in the rainy season for a similar purpose. An experiment in this respect is being tried in the village of Awas in the Alibág Táluka, and the result can be known only next year after the manure so prepared is used. Samples of such manure from the different pits can be sent to the Agricultural Chemist if desired for testing their utility in the month of May when the pits will be opened for removing the manure to the fields. It will be a help to know whether the manures so prepared should be laid in the fields during the cold weather and allowed to be exposed there or whether they should be removed to the fields just before the beginning of the rainy season. Rubbish and farm yard manure are found to be excellent manures for rice fields, and it is to be seen whether the artificial manure will prove equally efficacious.

Reclaimed salt rice lands do not require any manure. The greatest care in their case is to prevent sluice water flowing into them, and for this purpose the embankments and the sluice gates have to be kept in good repair. As mentioned by Dr. Mann in para. XIII (D) of his report for 1908-09 (Appendix F) salt rice can grow in these lands a few years after they are dammed if rain continues to fall without long breaks. After salt rice has been grown for some years on them the more inland portions of them receiving drainage from hill brooklets can grow certain varieties of sweet rice. The largest reclamations, however, generally grow salt rice of various kinds.

There are very few real rabi lands in the Konkan. The majority of the lands classed as rabi at the time of the last revision survey are only flat lands formerly used for grazing cattle or for growing grass for *ráb*. A few land-holders having dug wells and got sufficient water, grew grafted mangoes on such lands and the Survey Department classed all flat lands as rabi lands and raised the assessment on them. Water, however, not being available everywhere and every land-holder not being in a position to plant grafted mangoes several of the so called rabi lands were converted into rice lands, but for want of sufficient water and good manure they have been generally giving only a poor return. The Department of Agriculture can teach the agriculturists to turn these lands to the best advantage by showing them how some useful crops can be grown on them. If it could be shown that with the jumper bar, the Cawnpore boring apparatus, or by torpedoing bore holes in rock a sufficient supply of water could be had in such lands, especially in the Thána and Kolába Districts, land-holders would be only too glad to grow useful crops on them. It seems grafted mangoes, tapioca, sugarcane, cotton, ground-nuts and potatoes can be profitably grown in the Konkan on a large scale.

Varkas lands in the coast villages are mostly needed for grazing and for growing grass for *ráb*, but in the hill tracts the inferior crops nachani, vari and harik which mostly form the food of poor people are grown. In the Ratnágiri District harik occupies nearly 35 per cent. of the tillage area, nachni 27, vari 16 and rice 14; harik has a narcotic property and has to be steeped in a mixture of cowdung and water before grinding. As it forms the staple food of a large number of poor people, it would be an advantage to find a substitute with less unpleasant effect to grow in its place or to improve its quality by some means.

The recent vagaries of the monsoons have led a great many cultivators to grow early crops in lands usually growing late crops. When the September and October rains fail the late crops suffer considerably. If early crops are grown, they cannot be gathered in time when the rain continues to fall in September and October, and there is a serious loss of grain. The Department of Agriculture will render great help to the cultivators of the Konkan by introducing some varieties of early rice which though ready to be harvested in September may withstand rain and storm for some time. This year a new

variety of a very early crop of rice has been introduced in the Uran Petha. The crop has been ripe for over a week and much damage is likely to be done to the grain and straw if the weather should continue to be inclement for a few days more.

In this connection it may be brought to the notice of Government that if a portion of the money to be spent on irrigation could be spared and utilized for damming the innumerable streams and brooks to store the hundreds of thousands of gallons of rain water that flow into the Arabian Sea, hundreds of acres of rice land would get a good supply of water when the September and October rains should fail, and the cultivators would be enabled to grow the usual varieties of rice. The collected water will also be utilized by the cultivators in growing vegetables and other crops in the winter and may prove a paying concern.

The Annual Report of the Department of Agriculture, Bombay Presidency, for the year 1908-09 is delightful to read, being full of much useful information. Its perusal is likely to generate hopes in the heart of the Konkan agriculturist that if he should have the advice of the officers of the Department, he could grow more crops on his fields and improve his condition. Leaflets in the vernaculars of the districts explaining the methods of cultivation, the advantages of the new implements, engines and apparatuses over the old ones, giving directions for their use and stating their prices would be very useful to those who should think of making experiments in these matters. It would be an advantage if the talátis, pátils and other village officers could be instructed by the district officers to explain the contents of these leaflets to the cultivators.

Agricultural associations are useful institutions in bringing together officers of the Department of Agriculture and the cultivators as well as others interested in agriculture, but it seems that a few experimental farms in the Konkan managed by the Department will be a great advantage. It is hoped, therefore, that the Conference will recommend the establishment of at least two experimental farms, one in the Kolába District and another in the Ratnágiri District.

Mr. S. K. Wodyar, Inámdár of Chawaddhanpur, asked Government to provide apparatus for boring wells through rock, and advocated the introduction into the Southern Marátha Country of pumping plants managed by Government to raise water from rivers, offering his own land for the purpose. He suggested that an agricultural station should be opened at Ránebennur, and mentioned several plant diseases and other problems that might be investigated there.

Mr. V. S. Mutalik, Honorary Secretary, Bijápur Agricultural Association, then said :—Sir John Muir Mackenzie and gentlemen,—As Honorary Secretary of the Bijápur Agricultural Association I beg to offer such suggestions to the Conference as, if carried out, are expected, in my humble opinion, to enable landlords and peasants to reap more benefit from the Agricultural Department than is possible under the present conditions. My first suggestion is that the Department should undertake the work of translating into the vernaculars of the Presidency all the important leaflets published by the Department and of circulating printed copies thereof on a large scale, especially among the villages noted for agriculture. My second suggestion is that the Agricultural Department should start special schools at places where Government farms have been opened and there impart instructions in the vernacular languages regarding the adoption of improved methods of cultivation, the selection of seeds, the preparation of manures, the use and repairs of agricultural machinery, including the modern water-lifts for irrigation purposes, and the treatment of ordinary cattle diseases. Such schools will be within the reach of the cultivators and are likely to produce immediate results. The third suggestion is that the Agricultural Department should devote more attention to the finding out of the most suitable and cheapest modes of raising water from wells, rivers, etc., for irrigation purposes, in preference to the *mot* system, for the use of ordinary rayats, whose lands range generally from 10 to 20 acres. The importance of this discovery may be gauged by the fact that it will save from starvation, in times of drought, thousands of families who may own lands on the river side and may possess good wells in them. The amount of expenditure that Government will have to incur

in this behalf should be no consideration, as the benefits that may be derived from the discovery, all over the country, will be out of proportion to the cost. The fourth suggestion I want to make to the Department is that it should hold annual shows every year in each district on a small scale at important agricultural centres, where the contributions obtained for the purpose should be utilized more for the purpose of shewing demonstrations, receiving various exhibits and agricultural machinery, and discussing the remedies to meet the local difficulties and necessities by means of the assistance of the experts. Suggestion No. 5 is this. At least one depôt should be established for the present during each sowing season in each district, to sell and also to distribute gratis, to some extent, selected seeds of various kinds, and also to sell and hire agricultural implements and machinery of a modern type. Sixthly, I would suggest that sufficient grazing areas should be reserved in each village, in proportion to the number of cattle there, in order to enable the cultivators to preserve the existing cattle from starvation and to breed a better sort in consultation with the Agricultural Department. The sale by Government in the past of most of the cultivable waste survey numbers for cultivation, the appearance of frequent droughts and the rigid system of the Forest Department, have made the condition of cattle most desperate; so much so that the hope of breeding a better stock of cattle should be totally abandoned, unless immediate lenient steps be taken to remove the obstacles. It is not possible to expect an ordinary rayat to expend more money in the hope of breeding a better stock when he knows that good bullocks could not be saved in the locality from being sold for a few rupees for being slaughtered. The seventh suggestion I wish to make is that the spread of primary education be made among the masses, who are agriculturists, and that they should be vastly encouraged by making the education free and compulsory. If the masses are not illiterate the interposition of others as interpreters on their behalf would be superfluous, and the results aimed at will come of themselves more speedily and directly. The eighth suggestion would be this that the Agricultural Associations should be entrusted with certain work of the Agricultural Department itself; it will save the expenses of the Department to some degree. A sort of supervision should be entrusted to the Associations, which will create more confidence and energy in the minds of the members of the Associations.

Mr. R. R. Bhardi of Poona then said:—Gentlemen,—The report of the Agricultural Department is a very admirable compilation. It contains very useful information and important recommendations. We know that our cultivators were formerly conservative, but now they will not hesitate to adopt any suggestions made for improvements by experts if they find that they can introduce the improvements without any additional expenditure. They take up important suggestions very easily in different directions. There are excellent suggestions made in the report on various topics. If the cultivators are taught how to improve the present condition of their fodder, they will readily appreciate the new methods of improvement and introduce them in their operations. Leaflets on wider planting, thin seedling, etc., should be prepared and translated and distributed as widely as possible among the cultivators through village officers. If possible, Committees should be formed in important villages and copies of the vernacular translations be sent to them for information and circulation. Information about the experiments of *râb* would be very valuable to the cultivators. I have served in the Thána District, and I know that the cultivators there require better information on the question of *râb*. It is, therefore, necessary that the leaflets should be prepared on the subject and that they should be translated in the vernacular and distributed among the cultivators through village officers.

Mr. Chimanlal Harderam of Broach then said:—Cotton is now the staple product of the district of Broach. Broach cotton is prized for its fine lint and long staple and holds a premier place in the Indian market. Cotton planting has been pursued in the district for numerous centuries, and the *Mahâbhârat* and old chronicles speak of Broach cotton in terms of praise. The area growing cotton has increased, nearly half the cultivated area being under cotton, but the quality of the crop is deteriorating. Navsâri cotton is now found to be superior to Broach and the latter is fast losing the

reputation it commanded for centuries. Now, this ought not to be if it could be helped. This soil of the district is best suited for cotton culture, and though the rainfall was for some years irregular, the climate of the district has not changed, and the irregularity in the rainfall is admitted not to have affected cotton culture in the district adversely. In brief, it may be safely said that the causes of the deterioration of the Broach cotton are all human and can be remedied. It is admitted that Broach cotton has attracted the notice of Government and merchants, and efforts were made in the past to improve the yield and quality of the staple by introducing new varieties of cotton seed and improved methods of cultivation, as well as by preventing admixture. However, experiments and efforts failed, and Broach cotton seems to have been left to itself. It is submitted, however, that those experiments and efforts ought not to be regarded as final and conclusive. They were made between the years 1812 and 1873, at various intervals, and with a view to grow the Bourbon, New Orleans, Sea Island and other American varieties. The Egyptian was also tried, and failed. These experiments were made by planters and others who were not agricultural scientists, and whose knowledge of the soil, climate, and language of the country was very limited. Agricultural science had then not reached the stage it now occupies, and its many valuable discoveries and devices were not at the disposal of the pioneers. Besides the Agricultural Department was not in existence in those days and we had not the close, scientific and well organized information about the soil and the climate of the country which the Agricultural Department now possesses, and experts with intimate local knowledge were not available then as they are now. Moreover, it has to be remembered that the old experiments had been made with purely foreign varieties. Acclimatized varieties, hybrids and indigenous varieties were not tried. The experience gained at the Government model farms contradicts these experiments, and with the knowledge and the means we now possess we ought not to leave Broach cotton to its fate.

I humbly propose to offer a few suggestions which may help to mend matters, and to prepare the ground for successful experiments, should any be undertaken in future.

(a) The cotton mostly grown in the Broach District is of Lalia variety. It is however admitted on all hands that the pure Lalia is rare, and owing to admixture at ginning factories the seeds of the pure Lalia cannot be procured in sufficient quantities. A few well-to-do and intelligent farmers preserve pure seeds and sow them, but the majority get their seeds from dealers who get the cotton seeds from ginning factories. The operations of those who admixture the Lalia with inferior sorts at and outside the ginning factories cannot be checked by the Agricultural Department. But, the Department can help to procure pure seeds in sufficient quantities at reasonable rates and depôts for the sale of good selected seed can be established in important growing centres. District officers, Zamindars, intelligent land holders, and Agricultural Associations, if any exist in those centres, may be expected to persuade the cultivator; to give up his ruinous ways, to leave his fields fallow by rotation, and to sow the best seeds available.

(b) District and Táluka Agricultural Associations may be established. Separate committees or associations in important and flourishing groups of cotton growing villages may be formed. These associations may be helped and encouraged to establish model farms where Government do not find it convenient to establish any. It would not be found difficult in these days to find enthusiastic workers in numerous villages. There are intelligent and prosperous Tálukdárs and landholders in every táluka of the Broach District. Many of the Bohra villages of the Broach Táluka, which rank as most important cotton growing villages, can now boast of educated and well-to-do cotton growers and merchants. Some of them have travelled to Africa and possess an adventurous and commercial spirit. Their co-operation may be secured. It is worthy of note that there is not a single model farm in the Broach District.

(c) The Agricultural Department may be asked to consider the desirability of classifying the soil of the district from cotton growers' point

of view. Fertilizers and artificial manures suited to the varieties of seeds and soil may be prepared and recommended. And steps may be taken to demonstrate to the villagers the advantages derived from these aids which science can give them.

(d) The Agricultural Department would do well to distribute the knowledge acquired in the model farms and stored in annual reports to the villagers. Happily every village now possesses scores of persons who can read, and leaflets and pamphlets written in Gujaráti would prove a valuable means of instruction provided they are written in easy Gujaráti and free from technical terms not properly rendered into the vernacular. Short treatises on cotton culture, dealing with the indigenous and other plants, the cotton climate and soils, manures and fertilizers, diseases of cotton, and planting and harvesting of cotton, may be written to suit the requirements of farmers and published by the Department. The curriculum in vernacular schools now includes object-lessons. The best object-lessons for village schools would be those dealing with the principal product of their country side. If necessary, village school masters may be invited to visit model farms and impart to their pupils what they have seen and learnt there. Every village school can be provided with a small garden where the teachers with the aid of his boys may endeavour to put the lessons given to a practical test.

(e) Agricultural shows and fairs may be held every three or five years, and village schools may be invited specially to compete in these shows. Individual farmers must be persuaded to send in their exhibits and village authorities can well persuade prosperous local farmers to undertake interesting experiments under the guidance of the Agricultural Department.

So much for the culture and improvement of the *Lalia*. There is ample evidence to show that other varieties of cotton were cultivated with marked success in the Broach District. Broach was formerly famous for its fine Muslins, which were equalled by the historic *Dacca* fabric alone. The varieties of cotton which would yield the fibre for the purpose are extinct in the district. The disappearance of the *Narma* or *Dev Kapas* is much to be deplored. The *Narma* cotton gives a lint which is long stapled, silky and of fine colour, and would fetch handsome price. There is no reason why it should not grow if a proper environment is secured. The writer of this note reared about 100 plants of *Dev Kapas* in the *inám* village of *Tham* in the Broach *Táluka* in the year 1907. A large number of them was planted in the *Ghaban* land of the *gorat* kind; a few plants were put in his garden. All the plants thrived well during the monsoon, but after the rains were over, the plants in the *Ghaban* withered away, but those in the garden are doing well. It would seem that the plants in the garden are irrigated, and therefore, they are doing well. There is a large area of rich alluvial soil in the district with facilities for irrigation, most of which is under direct Government control. If Egyptian, *Narma* and exotics which require irrigation are tried in this area, promising results might follow.

The foregoing suggestions have been made in the hope that, if they are approved, the attention of the local men and associations may be drawn to them, and enquiries may be made as to how far they are prepared to co-operate with Agricultural Department in the task of improving cotton culture in the Broach District. Secondly, I find from personal experience that as the results achieved and experience gained at the different model farms are not within the reach of those who do not study annual reports, it is erroneously assumed that much information on cotton culture is not likely to be had. Mistakes are repeated, experiments are made without scientific knowledge, and fruitless and ill-conducted attempts are magnified into conclusive results. I hope to bring within the reach of the cultivators of the Broach District, information collected by the Department on the points touched by me, if my attention is drawn to sources from where reliable information can be had.

Dr. Harold H. Mann, Principal, Agricultural College Poona, then said:—
Mr. Chairman and gentlemen,—There are two or three questions which were important in the discussion that we have had just now. On behalf of the Agricul-

tural Department I would speak a few words in reply. Gentlemen speaking for Kolába and Sálsette suggested, I think, that analysis might be done by Superintendents of the various departmental farms of the Presidency. I am afraid that question is quite impossible to be tackled in such a simple manner. But this I will say that the Superintendents of farms throughout the Presidency will always be too glad to send round samples for analysis to me because they have not got the appliances to do the analysis themselves and I can guarantee that the analysis will be done by me. The second point is about the substitute for *ráb* in connection with rice cultivation. It is a point of which, I believe, we can hear a great deal more before the end of the Conference. This question has been before this Department since the early eighties. Numerous reports have been published and numerous investigations made in connection with it, but we have really not gone much further than where we were at the beginning. I think that during one or two years Mr. Knight's experiments at Lanauli have led us very considerably further than one would have anticipated. The experiments suggest that we can substitute for *ráb* a great many materials which do not cost any more than the *ráb* costs. For instance, in my own report which is not published and which is not available, I have given the cost of various materials which can be used in substitution for *ráb*. (Dr. Mann here goes into various figures.) I don't think the question will be of permanent difficulty. Investigations and progress of experiments lead us to be confident of success. I won't say more until the experiments are complete. I have hopes that they will give us the means of dealing with the question of *ráb* which we have not got at present. There is one other matter to which I should like to refer, and that refers to leaflets about "wider planting" seed selection, &c. I have taken note of the suggestion that has been made. I think that although a leaflet on this subject is not yet prepared, yet, in accordance with the suggestion made, I will see to the preparation of one at once. With regard to "wider planting" experiments were being made in three districts, and until we get exact information I don't like to put forward most indefinite statements with regard to the subject. The question is under very careful consideration, at present, of Mr. Knight, and at the end of the year we hope the materials will be so far advanced as to enable us to put forward for certain districts, at any rate, leaflets on planting.

Mr. G. M. Ryan, Deputy Conservator of Forests, said:—Mr. Chairman and gentlemen,—Reference is made in Mr. Knight's interesting report to fibres. In that connection I wish to bring to the notice of the Agricultural Department that there is one very common plant known all over the Presidency as 'Calatropis'. It yields very excellent fibre which, when nitrated, was equal to silk. I suggest that experiments in the cultivation of the fibre should be taken up by the Agricultural Department. A large export trade would be brought about from it.

Mr. W. Burns, Economic Botanist, said:—Mr. Chairman and gentlemen,—Twenty years ago a report on the plant *Calatropis* was prepared by Drs. Cooke and Watt. Their report was unfavourable, the estimated cost of production exceeding the selling value. I believe, however, that Mr. Ryan has been making experiments which are more promising. If he will put his results in the hands of the Agricultural Department, I shall be glad to pursue the question further.

The Honourable Sir John Muir Mackenzie said:—I gather that there are many gentlemen who wish to read papers. Before we go further I should like to suggest that it would be far more useful to restrict each paper to a single topic, in the way in which Mr. Ryan has done. That topic can be discussed and our officers can at the end of the discussion give answers and explanations. We shall also in this manner avoid a great deal of useless repetition occasioned by members in their various papers covering the same ground.

Before we adjourn there is one topic on which I should like to say a few words. It is not a strictly agricultural topic, because it refers not to the work of the Department but to the general administrative action of Government. I allude to Forests. It is evident that the restrictions occasioned by Forest Administration are much more in the thoughts of many members of this conference than the immediate work of the Agricultural Department and direct measures of agricultural improvement; and the chief restriction that gives rise

to complaint is the restriction on grazing. Now, I should like to convince you that this restriction, such as it is, is enforced by no means in the mere interest of forest revenue but is necessary in the interest of every cultivator who owns cattle. If grazing were to be allowed, as many people desire, without restriction over the forest areas, as in the old days, the grazing which is poor enough as it is would only go from bad to worse. In order to maintain what grazing you have, a certain amount of rest is absolutely required for the land to prevent the complete destruction in time of the even now scanty herbage of most of it. Not only that but forest grazing will never suffice for you if you desire to improve the breed of cattle. For that purpose it is absolutely necessary for you to collect, grow and store fodder. Some of the serial crops of this country, *e. g.*, jowári, yield admirable fodder; others however do not. I recollect many years ago finding in the táluka of Kopargaon in Ahmednagar one huge wheat field. From many parts of it jowári had almost disappeared. The reason was that at that time the export trade in wheat was developing rapidly and people were tempted to substitute wheat for jowári. The consequence was that the cattle in Kopargaon Táluka deteriorated rapidly and lamentably. Most of them were absolute skeletons. The lesson is that you must in the interest of your cattle learn to rely less on common grazing lands, and grow crops useful for fodder, and perhaps even set apart lands for pasture. These are matters regarding which of course the Agricultural Department will be ready at all times to give you advice and help.

To return to the Forest question. It is often alleged that forest restrictions are responsible for a diminution of cattle in this Presidency. I should like to assure you that this is not the case. I have recently had an examination made of the figures relating to cattle. They show among other things that in the nineties when on the whole the forest restrictions were decidedly more severe than they are now the number of cattle was far larger. On this question the statistics of the famine years and those following them are very interesting. The famine of 1876-77 resulted in the diminution throughout the tracts affected by it of the cattle by one-half. After that famine however the numbers of cattle increased steadily and rapidly until the zenith was reached in 1893-94. Then came the famine of 1896-97, which again brought down the number of cattle by one-half. Recovery was just beginning when the famine of 1899-1900 came with more disastrous results than any previous famine. In some districts of Gujarát the cattle were almost wiped out while in the Deccan there were again heavy losses. Of course during the famine the grazing restrictions were everywhere relaxed, but of course the relaxation of the restrictions was utterly powerless to prevent the great mortality among cattle.

Since the last great famine there has been steady recovery in the numbers of cattle, and that although of course the forest restrictions have been re-imposed.

The inference is that forest restrictions on grazing have never had any effect on the number of cattle. In good years the cattle multiply and in the years of severe drought they diminish. Personally I am convinced that not a single cow or bullock the less has been bred or reared on account of any action of the Forest Department; and indeed I think it exceedingly probable that owing to the conservation of grazing forest the supply of grazing has been, if anything, improved. However that may be, you may rest assured that Government are doing everything in their power to make the restrictions as little irksome to the people as possible.

The Conference then adjourning for half an hour, a discussion was then invited on Agricultural Education, on which subject many gentlemen attending the Conference had expressed a wish to speak.

AGRICULTURAL EDUCATION.

The Hon'ble Mr. W. H. Sharp, Director of Public Instruction, said:—Mr. Chairman and gentlemen,—I must say that nobody has yet succeeded in persuading me that we should teach agricultural subjects, in any strict sense of the term, in our primary schools. In the course of this year various gentlemen have given me suggestions on the subject of primary education, and I think they all agree on this subject, whether educational officers or revenue

officers. Only the other day one of the Commissioners actually sent me some suggestions about primary education and had finished by saying "Above all, for goodness' sake don't attempt to teach agriculture, or you will make your system ridiculous." When the school-masters start teaching agriculture, they are teaching a subject about which in most cases they know nothing. The boys whom they teach often know, I suppose, more about the subject, than themselves. What is done, at present, is this: Some years ago, Professor Knight drew up three Agricultural Readers, *i. e.*, as reading books, in which lessons dealing with agricultural subjects, instead of ordinary literary subjects, were treated. These Readers have been translated into Maráthi and have been taught in Maráthi primary schools for two or three years, and orders have now been given for them to be translated into other vernaculars. In this way it is thought that the agriculturists' boys may be induced to take more interest in reading lessons, because the lessons deal with agricultural subjects. Masters have been instructed in the explanation of these reading lessons. For this purpose an agricultural teacher has been added to each of the Training Colleges, and masters under training receive lessons on agriculture. Explanation is given on their own farms, if they have any, and in the case of Poona they are taken to the Agricultural College Farm and shown various agricultural operations. This process has to be limited as the masters under training have to learn a number of subjects. I think there are 16 subjects in which a master is examined, and the course of agriculture is only the 16th or 17th. The amount of time which is given to agriculture is only 2 or 3 hours a week. It may be sufficient to enable the master to go through the Agricultural Readers with a fair amount of success, but that knowledge is not sufficient, when he goes to teach in a school, to enable him to teach agriculture in any real sense of the word. Whilst such masters are not fit to teach agriculture, I venture also to think that boys, during the time they are at school, are not fit to grasp the subject well. The boys of the agricultural class usually leave the school very early. As far as my knowledge goes, they do not actually engage themselves in any particular agricultural operations. I understand that they are employed to look after cattle,—thereby enabling the owners of the cattle to be free to look after the agricultural operations, or they are employed to scare away birds, but they are not old enough to practise what one would call agricultural operations. During the school period they are able to read something of agricultural topics and they are shown some experiments of a chemical nature. In Japan there is a lot of agricultural education. It is not done in ordinary schools. It is done in special schools. In my opinion, it would have to be done in the same way here also. It seems to me that the persons who ought to be taught agriculture are boys who have left school after having acquired the knowledge of the three R's. It seems to me it is not the work of the Educational Department to give agricultural education; it is the work of the Agricultural Department. It seems to me that what we require is that there should be some agricultural experts who must be able to go round and catch hold of some of the young fellows who are starting upon farm life and see what they can do with them. I would make a suggestion to the Agricultural Department itself that they should utilize pictures when they go to people to give lectures. They should attract people to listen to their lectures by means of pictures and magic lanterns. Show the people pictures in some form or other, and then you can get them to listen to your lectures. That, at any rate, is how the matter strikes me. It is useless to try to teach men, under training, the regular course of agriculture in the Training College, because they have no time to learn it. But selected masters might be taken, at the end of their ordinary training, through the special course of agriculture. This is the opinion that I have formed, at present. But I am quite open to conviction on the subject, if anybody here can suggest any practical scheme by which agriculture can be taught in the ordinary schools. One of the speakers this morning referred to a school garden. There some preliminary work may be done; but it would hardly be agricultural. It might be useful in a preliminary way, just as illustrated lectures will be.

Ráo Bahádur Khandubhai Gulabbhai Desai (of Surat) said:—Gentlemen,—When I proceed to deal with the subject of primary education for the masses

want to show that the children should not only be taught reading, writing and arithmetic. My view is that every child should be accustomed to work when at the end of educational course. It is done in America, it is done everywhere. In this country also it would be necessary to be done. One of the results of the present method of education is this: as soon as a child learns a little of reading and writing and when he is grown up to the age of 15 or 16 years, then he thinks he is entitled to be something else than a mere agriculturist or an artizan. To improve the general capability of a child to become a good artizan he should be given tuition through his eye and his hands, and that can only be done by making him do actual work every day for a certain number of hours. Scientific agricultural education cannot be easily understood by the child. He should be prepared for industrial education, and for that purpose, he should be taught, besides reading, writing and arithmetic, some trade or something which he can do in after-life. I know that for this purpose you want workshops to be attached to the schools in villages. Three hours a day ought to be quite enough to enable boys to get, in a fairly short time, all that they want in the shape of reading, writing and arithmetic, and three hours a day should be devoted to doing some work with their hands. I don't wish to say that the work should be of a particular nature; I say the work should be such as would be useful to the boys in their after-life. In the case of villages I propose that every school ought to have a farm of about 10 acres attached to it, and, if possible, wherever there is good water, there should be a well in it and that a part of the farm should be planted with trees, flowers and vegetables and that they should be grown by means of irrigation. The other part of the farm should be devoted to ordinary kharif and rabi cultivations. The boys should be taken every morning through the farm under the guidance of their teachers and thus they will acquire definite instruction on different subjects. In this manner they will have very useful knowledge and they will become trained agriculturists even from their youngest age. It is not impossible to organise schools in this way. Suitable masters will have to be found before you open schools of agriculture. You have to go to the Educational Department for that purpose. The Readers, instead of being confined to general subjects, should contain some lessons on agriculture. I believe, in England, Readers meant for children of agriculturists are prepared in this way. I don't know whether such Readers are prepared here also; if they are, they have not been introduced in schools; that is my information. Today some people acquire a certain amount of literary education which makes them desirous of higher rewards. I do not grudge them the fulfilment of those desires, but I ask you to remember that out of the total population of India, probably 90 per cent. have to earn their livelihood by working with their hands and if we don't give them education to suit their purpose, we will prepare a short way for creating a large amount of discontent. Then time will come when instead of increasing the number of schools, you will have to stop them. Remember that in the competition with other civilized nations the people of India will simply disappear. India has ceased to produce all the sugar required for home consumption. Her people don't know how to grow sugarcane. People here can hardly produce one-sixth of their requirements. Many experiments have been tried, but still it cannot be done. Therefore, you should begin at the beginning and let people know something about these industries. Let them be induced to take more and more interest in, and try to understand, these subjects.

Mr. B. V. Jádhar of Kolhápur said:—Mr. Chairman and gentlemen,—Though I belong to a community which maintains itself solely on agriculture, still I am not here to speak to you of my agricultural experience. It is very difficult to introduce the subject of agriculture in vernacular schools, because it is very difficult for the sons of agriculturists to acquire the knowledge of the vernaculars. I think it will be of no use to introduce agriculture in primary schools, because boys attending the schools are too young to grasp any principles of agriculture and when they are sufficiently grown up they generally do not attend schools. So, I think, special schools or classes should be introduced on agricultural farms in every district or in every important place and in such schools you might admit boys who have learned up to the vernacular 4th, 5th.

or 6th standards. These boys will be of 15 or 16 years of age and they will have the elements of the subject at their fingers' end. In that way, I think, agricultural education may be made to prosper.

Mr. K. L. Desai of Islámpur said :—Mr. Chairman and gentlemen,—There is no difference of opinion as to the necessity of agricultural education being given to the sons of the agriculturists. The only question is as to what kind of education should be given and in what way it should be imparted. There are two ways suggested for this. The Director of Public Instruction says that arrangement for this education should not disturb the existing system of primary schools. It is suggested that when a student has completed his primary school course up to the vernacular 4th standard, he should join any special class or school that may be started for giving such education. Then it is said that if such schools are necessary, they do not fall within the province of the Educational Department but of the Agricultural Department. I suggest that the present system of agricultural associations may be utilized in starting special schools. Schools may be launched under the directions of local bodies; such schools may be established at every táluka station and should be under the directions of local bodies, especially the agricultural associations. Capable persons may be found to serve on the associations in táluka stations. Sons of agriculturists should be admitted in such schools, and three years' course would be sufficient for them. There may be a difficulty to get the details of the scheme discussed within a limited time, and, therefore, I propose that for the consideration of this subject a committee may be appointed and its report called for as to what suggestions it makes for imparting this education as to what subjects should be taught, and how the Agricultural Department should proceed in this direction.

The Hon'ble the Chief of Ichalkaranji said as follows :—Mr. Chairman and gentlemen,—There are two proposals before us. One is that primary schools should teach agricultural subjects, and the other is that special schools should be started where agricultural subjects should be taught. Each of these proposals has its own defect. In the first instance, as Mr. Sharp has pointed out, it would be difficult to teach agriculture or any rudiments of it in primary schools. Just 4 years ago it struck me that something should be done in the matter in one of my own villages. I thought of attaching garden land to the school where some flowers and crops were planted. The principal difficulty was that the students were unwilling to learn the subject. You must remember that by far the majority of students are the sons of agriculturists. Only a certain number of people there are not agriculturists and they require manual labour. I agree with the previous speaker that it is necessary that in schools some manual training should be introduced; the sons of agriculturists or the sons of peons, who have learned 3 or 4 standards, are quite unfit to do any work in fields unless they are taught manual work; but the remedy for that, I believe, is not the teaching of manual labour in primary schools. To teach it there is to make the primary school education unpopular. With regard to having special schools for agriculture I must point out that the whole idea of education in India is that we send our sons to schools for education, because when they have finished their course, they look for employment. When our sons finish their course in Technical Colleges they want employment in mills, they want service, because they cannot undertake any industries at their own expense. So that, there are difficulties in founding smaller schools for agricultural purposes: the first difficulty would be that very few persons would be willing to send their sons to the institution, and secondly, those that will send them will expect employment for them after they have finished their course. If no employment could be got for these sons, then the institution will be a failure. I must remind you, gentlemen, that education does not, after all, consist in the arrangement for classes. The Agricultural Department is trying to do its best to give *boná fide* education by means of demonstration farms. The real persons to discuss this subject are the agriculturists themselves. The best way to reach them is to adopt the methods which are undertaken by the Agricultural Department. I do believe that many of the landlords would think the best way of improving their estates would be to give their children thorough agricultural education and then let them work on the estates. The best way.

of improving our lands in point of their yield is to work on them on scientific methods. The people who ought to go in for this sort of thing are the people of means, people who have got wealth and large plots of lands on which experiments could be made. Landlords and people of noble families ought to encourage agriculture in this manner. In this connection I may be permitted to make a suggestion. In the Grant Medical College of Bombay they admit students who do not want exactly to appear for examinations of the University; they only want to learn the subjects. They are examined privately and given Diplomas. I think the same system should be introduced in the Agricultural College. Some people should be asked to go there and study the subjects, and if they pass examinations held privately they should be given Diplomas. It would be a great inducement to people to have Diplomas in that way, and when they return to their estates thereafter they would do much good in many respects on the question of which we have been talking.

Mr. Ambashankar Uttamram Malji said :—Mr. Chairman and gentlemen,—All the previous speakers are agreed on one point, viz., that the land has deteriorated. The second point is as to the agricultural education. On this point the opinion is divided. Although there is no unanimity of opinion, still we must not despond. We must find out a way out of the difference of opinion. We know where there is a will there is a way. The learned Director of Public Instruction told us that it would not be possible to teach that subject in primary schools. Well, to some extent he is right. It has been suggested by one of the speakers that agricultural stations should be opened in towns where there should be schools for teaching agriculture. If such schools are started, they would prove, I think, very beneficial, first, because the boys that will go to those schools would not be more than 13 or 14 years of age,—an age when they cannot aspire for Government service or for any other employment; secondly, because that is just the time when a man is ripe to receive instructions, may be in agriculture, or any other subject. I suggest that each village should have an agricultural school. If it is a small village, then let there be a group of such small villages, and for each such group let there be one such school. If necessary agricultural associations should be formed in the villages or groups of villages to look after the schools, if proper agricultural education is imparted in the schools, it would be a great inducement for people to send their children to the schools. Experiments and demonstrations should be made available in the schools. If people have no agricultural education their cultivation will suffer, and consequently the Government revenue will not be paid by them.

The Hon'ble Ráo Bahádur S. K. Rodda said :—Chairman, Sárdárs and gentlemen,—As I was connected with the primary education for the last 40 years, both as School-master and Inspector and as the Principal of a Training College, I think I am entitled to second the proposals of the Hon'ble Mr. Sharp. When an agricultural conference is held, agricultural education rules supreme. When a technical or industrial conference takes place, technical education comes forward to take the most prominent place. Whatever the course of things be, it is my honest opinion that primary education should not be interfered with, nor should the same give way to the several branches that might be suggested. Primary education is the basis of all education and paves the way to special education. The idea that agricultural classes should be attached to every primary school or most of the primary schools is not only premature but utterly impossible. The remark by one of the previous speakers that the instruction imparted in our primary school is of an abstract nature and is simply routine is not supported by facts. There was a time when the old Pantoji taught everything by rote, but the new methods introduced are calculated in great measure to root out this evil. Multiplication tables are now taught by concrete examples, the counting occupations and other things taught will bear testimony to my remarks. As regards agricultural education, the masters called upon for retraining are given special instructions to teach the agricultural lessons in the reading series; the natural history lessons are taught in the same manner. The books prepared by Mr. Knight on agriculture and Mr. Metha's work on agriculture are studied by the students under training. As regards the Southern Division I am glad to say that a number of masters are agriculturists or sons of

agriculturists and the education given to them in this respect is not wasted but bears fruit. Intelligent masters can do much in this respect. I know an instance of a school-master who rented a small *parada* number and planted potatoes with the aid of his boys. This was in a place where potato cultivation was unknown. In another place a master planted tobacco in order to remove the prejudice that tobacco cultivation would ruin the planter. Hence the masters are doing their best in giving instruction to the agricultural classes. I am therefore of opinion that the primary schools should not be disturbed in their present working. If agricultural education is required, and it is required no doubt, special schools on a small scale, say one or two, should be established for the benefit of each *táluka* and boys who cannot prosecute their studies for public service and who cannot proceed for further study should be induced to join such classes. Most of the boys in villages leave the school after finishing their vernacular standard 4th. Education imparted to them in agriculture will, I am sure, prove beneficial to the rayats and to the improvement of agriculture in general. I am therefore one with Hon'ble Mr. Sharp that primary schools cannot do anything more than what they are at present doing. For agricultural education scientific lessons should be taught by means of actual demonstrations in each school, like kindergarten lessons. Instructions should also be given through books and leaflets. Everything depends on our school-masters. We cannot dictate to them. We require agricultural schools in the country, and in those schools we require school-masters to give agricultural education. What I now propose is that one or two villages should be selected in each *táluka* where agricultural schools should be opened. The villages selected should be on the banks of rivers. One or two primary schools should also be opened there. In the agricultural schools there should be a complete equipment of all the requisites. My idea is that in each *táluka* there should be model schools for imparting agricultural education. Municipalities are now coming forward to take this subject in hand. They want to make agricultural education more practical. If the municipalities, zamindars and local bodies take this subject up earnestly, there will soon be agricultural schools in every *taluka*.

Dr. Harold Mann, Principal, Agricultural College, said :—Mr. Chairman and gentlemen,—We have spent a good deal of time in discussing the subject of agricultural education. I have heard the profitable suggestions that are made. It seems to me, however, that the matter has not yet reached the point where we can state there is any degree of finality. We have to go a long way yet. At present we have this state of affairs. We have an agricultural college where we teach young men who have gone through certain standards of general education. We put them through a course of scientific and practical agriculture as well as we can. It is my ambition to make our Agricultural College in Poona, the best College in India. It is my ambition that the education which shall be given here shall compare with the education given in any other agricultural college in the world. It is also my ambition to make our agricultural graduates so that they would be valued both from agricultural point of view and from any other point of view in any other industry to which they might turn their hands. I believe we shall reach that point, although we are a long way off it. Working with enthusiasm and securing the support of the public we shall be able to achieve, in good time, much that I have said has been my ambition. We have to work gradually to reach the object of our ambition. This year we have started an experimental class of a different kind. We have begun like the Honourable the Chief of Ichalkaranji. We have taken young men, generally the sons of landlords, and we want to give them a short one year's course of instruction. The course is almost entirely practical. It gives them an insight into the best agricultural methods. This class is in an experimental stage at present. During the first nine months they will study in the college and work in the classes, and during the last three months they will study on our farms doing special work in which they are interested. This is an experiment which promises well; it will be of great value. I am hoping by next June that we shall be able to start a systematic one year's course for young men who have not been through the University and who do not go in for Government or public service, but who

wish to spend their time in their fathers' or friends' lands. This course is in English. I propose, next year, to go one step further and to take not only the short course in English but also a short course in vernacular. I feel entirely that this is a very great step, because in teaching the vernacular course we have to rely on our own graduates,—graduates whom our own college has produced, and I am confident that those men will rise to the occasion and that the course which they will teach in agriculture will be one of very great value. Now, one thing I must say. It is this. I do not want to take in that class young men who want to go in public service. It may be a very desirable thing—I suppose, it is one of human ambitions—for one to devote one's time to public service in its true sense. The object I have in view is not to take young men who want to devote themselves to public service. I want young men who would like to manage their own or their friends' lands. During the first year our course will be carried on in an experimental manner. We shall have only a limited number of boys and we shall have no test for admission. The course will be entirely in the vernacular. How far the experimental course can possibly be extended into an actual course, it is for time to show. It seems to me in this matter we have to go very slowly, stage by stage, and if we find that we are successful, then we may be able to go in a step further in having village schools and taluka schools. In these schools it is quite possible to have a similar course in the vernacular. The schools may not be started in Kánárese and Gujaráti to begin with; for we must await success or otherwise of the experimental course carried on in Poona; that is what I suggest. Now I will turn to another subject. I think we have all heard the discussion about agricultural education and we must feel that the question of agricultural education being given in primary schools, at any rate, must wait. I quite agree with Mr. Sharp on the point. At present, I think, we cannot consider that point. What is possible to do in the future, I don't know. When we meet with success in our experimental course we may consider the question of agricultural education being given in primary schools.

The Hon'ble Sir John Muir Mackenzie said:—I think we have had a very useful discussion on the subject of agricultural education, and I think the discussion may now with propriety be closed. I should like to express my satisfaction at the extreme keenness with which the subject has been taken up and at the unanimity shown in the opinion that Government cannot do or spend too much for the promotion in one form or another of agricultural education. When I press, [as I shall, for handsome allotments of funds for this purpose I shall feel that I have behind me a large body of enlightened public opinion.

After a vote of thanks to the chairman had been passed the Conference adjourned till the next day.

2nd Day, Thursday, September 30th.

The Hon'ble Sir John Muir Mackenzie in the chair.

The Chairman:—Gentlemen,—Before we proceed to business I will ask Mr. Mollison, Inspector-General of Agriculture for India, to address you on general topics. I am sure you will hear him with great pleasure.

Mr. J. W. Mollison, Inspector-General of Agriculture in India, said:—Mr. Chairman and gentlemen,—At this great Conference I have been delighted to meet a few old friends and particularly my old assistants whom I trained in the practical details of the work. Judging from the valuable discussion that took place yesterday, you are chiefly here to criticise the work of the Bombay Agricultural Department. I am here to listen to your words of wisdom and help in applying them, as far as possible, in other parts of India. In this Presidency I am on very familiar ground. I know the agricultural conditions fairly thoroughly. I had to learn them during my 14 years' service in Bombay, and try to apply the knowledge gained in the most practical way. In this connection I had, during my earlier years of service, to overcome many obstacles, which it is unnecessary to particularise. I may, however, say that had I foreseen the extent of these obstacles, I should never have come to India at all. Circumstances have very much improved since. I have referred to the

necessity of studying Indian agricultural conditions. They differ essentially from those in western countries. Experience gained in these countries cannot always or even often be applied in India. Therefore, it is incumbent on every one employed in the Department to get to know Indian agricultural conditions as thoroughly as possible. I have been bred on the land. I have been devoted to my profession from my early school days; yet I am not at all ashamed to say that I have learned a good deal more in India than I have taught. In Bombay I worked under four Civilian Directors of Agriculture. I had the greatest respect for each. None of them interfered with the technicalities of my work or took personal credit for any piece of useful work which I accomplished, but they had great influence with Government in obtaining grants for special requirements. The late Mr. Ozanne was my first Director. He was the father of real agricultural improvement in Bombay. Many of you must remember his cheery enthusiasm at work and his great personality. Another of my Directors was our Chairman, Sir John Muir Mackenzie. You all know the magnificent aid he has given to agricultural improvements in this Presidency, first as Director of Agriculture and now as Revenue Member of the Bombay Government. I have referred to my experience under Civilian Directors in Bombay, because there is a suspicion abroad in certain quarters, that such men are not the best men to direct the work of a technical department. I do not agree with this conclusion at this stage of agricultural improvement. The risk is that of rapid transfers and interruption of continuity in the work. This risk is not likely in Bombay. In any case, I congratulate Bombay on having at the head of its Agricultural Department a very able Director, my friend Mr. Keatinge.

I know that agricultural improvement in Bombay has made greater progress in recent years than in any other province. There are various reasons. In my time, in order to place before the people anything that was proved experimentally of value, it was necessary to enlist the sympathy of the Revenue Service from the Commissioner downwards. That influence will always be of great value, and I strongly advise the officers and assistants of the Department not to neglect it. A strong leavening of agriculturally trained men in the Revenue Service will materially help the work of the Department.

As shown in Mr. Keatinge's report, the establishment of experimental farms, demonstration areas, demonstration of improved methods, etc., has led to great results. The reason is that the work has been directed by competent men and largely controlled by Indian assistants, thoroughly trained in the science and practice of agriculture. In the field and in the laboratory the accuracy and value of every item of work done by the Department must depend upon the trusty supervision of the Indian assistants. The terms of service for these men must, therefore, be such that the right sort of men are not only attracted to the Department, but are kept in it. The present cry is for more of these men. They are not available. They have to be produced. For this purpose you have at Poona a magnificent Agricultural College fully equipped for the teaching of the science and practice of agriculture and allied subjects. I understand that the right sort of students—men from the soil—have joined the College course in considerable number. The most brilliant students will by and by wish to specialize in particular subjects, such as mycology, bacteriology, entomology and the like. The Central Research Institute at Pusa will give all necessary facilities for advanced agricultural education of this sort. Government, *as a start*, has made magnificent provision for agricultural teaching and has fully done its duty. At an important meeting of this sort, I think I am entitled to ask if the Chiefs of India and Indian gentlemen have generally done their duty. I do not think they have. The students, which we most particularly desire, are young men of brilliant, natural abilities who have been brought up on the land and have managed somehow to acquire a good general education. These young men are mostly so poor that they cannot afford the cost of advanced education in agriculture. I appeal, therefore, to Native Chiefs and other Indian gentlemen to help the cause of agricultural improvement by providing substantial endowed scholarships to help to educate at Provincial Colleges and at Pusa students of that class which we most desire. It is not now necessary to send Indian students to other countries to obtain the highest education in

agricultural science. The work of the Department, whether it is in the form of agricultural education in establishing experimental farms, demonstration plots and the like, should have one main issue in view, *viz.*, to reach the ryot and improve his material prosperity.

The Chairman said :—There are two points in Mr. Mollison's speech to which I should like to allude. The first is that of transfers of our Directors. Of this at present there is no danger. Mr. Keatinge has trained for this post, and he is pretty certain to remain in it a number of years. We also have another officer under training as an under-study.

The point to which I shall refer is scholarships. It is true, as Mr. Mollison has said, that much has not yet been done. But from one State we have had very substantial aid—I allude to the State of Kolhapur, which has furnished us with a scholar who has turned out one of the most valuable officers in the Department—I allude to Mr. Patil, who is the son of a village headman, and has been brought up from his boyhood in agricultural pursuits. He has distinguished himself in his academical studies, no less also in the field than in the laboratory. The great value of men like Mr. Patil is that the cultivators listen to them. When Mr. Patil lectures to the people they feel that he knows what he is talking about. He can come down from the platform, take hold of the plough about which he has been speaking, and work it before their eyes, like one of themselves. I earnestly trust other States and noblemen will follow the admirable example of Kolhápúr and furnish us with genuine cultivators like Mr. Patil and provide scholarships for their support.

We will now proceed to business. The next subject for discussion is "the provision of demonstration plots and a trained agriculturist for each taluka, and an adequate provision of selected seed." I think Mr. Deshpande will be glad to open observations on this subject.

DEMONSTRATION WORK AND SEED SUPPLY.

Mr. A. J. Deshpande of Muddebihal (Bijápúr) said :—Mr. Chairman and gentlemen,—We require agricultural knowledge to be given to agriculturists by means of practical demonstrations. Therefore, demonstrations are most necessary in those parts in which the agriculturists are required to take hints from the Agricultural Department and make improvements in agriculture. The demonstrations must be placed in localities where the people are eager to learn something about the new methods of improving agriculture. There are many intelligent cultivators in India. The demonstrations should be made only during the rainy season and only by the Agricultural Department or the Agricultural Associations, which should form themselves into Local Associations. Then only they can know the requirements of the people. The demonstrations should be intended to meet the requirements of the agriculturists only. The places where the demonstrations should be held are *Jatras* where various people assemble. Agriculturists generally prefer attending fairs, and the more so those that are held near temples or on the banks of rivers or ponds. The demonstrations should relate to water-lifts, machinery and the breeds of cattle. The famous "Dhun" breed and some of the other Gujaráti breeds may be included in the demonstrations. Implements should also form part of the demonstrations. Demonstrations held in fairs are too very useful as people usually come to the fairs from long distances. Besides these temporary demonstrations, there should be permanent demonstrations in each district. The Agricultural Associations should have experimental plots in which provision may be made for holding demonstrations at stated times in a year. As to seeds the Agricultural Department gave me four bags of "सुईया" groundnuts of high breed. In 8 or 10 days two of the bags were exhausted among people who applied for more. The Agricultural Department should be the advisers as to what things should be done by the cultivators. The Department should take special care about the masses from whom we take all our life maintenance.

Mr. Keatinge asked whether the seed referred to had been distributed free or sold; and Mr. Deshpande replied that the bags of seed were sold at the market

rate and one bag was distributed free. Mr. Keatinge then remarked that from a business point of view seed-grain was a totally different thing from food-grain. Seed-grain required to be carefully selected and carefully stored, and it was inevitable that good seed-grain should cost more than ordinary bazar food-grain. Mr. Deshpande replied that many good cultivators knew this and went long distances for good seed and were prepared to pay for it: adding that if Agricultural Associations were to arrange to sell good seed to the cultivators it would be a great boon.

Mr. Gopaldas V. Desai (of Nadiád), said:—Mr. Chairman and gentlemen,—The questions before us at present are two, *viz.*, demonstrations and supply of selected seeds. Demonstrations at places of fairs can be only of implements and cattle, as suggested by the previous speaker. I would suggest the introduction of one useful element at these demonstrations. It is that of the artizans. As at such places people of all sorts gather, the artizan class will surely attend. Thus, along with the necessary instructions, theoretical of course, regarding the use of implements, including water-lifts and pumps that are proposed to be given to cultivators, it is equally important to utilize the attendance of artizans by way of showing them how and where the articles are manufactured, how they can be fitted up, regulated and repaired. These artizans can try themselves and also find out if it is possible for them to manufacture any parts of the articles locally. I mean demonstrations of this sort can impart profitable knowledge and create no small amount of useful interest. The other and more useful part of the demonstrations can be provided for only on the farms themselves. To do this thoroughly and effectively, it is necessary to have such a farm in every village. In order to carry out this plan, Mr. Arthur Wood, Collector of Kaira District, formed a joint committee consisting of two representatives of the District Local Board and two of the Nadiád Agricultural Association, among the latter of which I had the honour of being one. Mr. Wood offered to serve as Chairman of the Committee. The Committee, thus formed, devoted much time and labour in drawing up a workable scheme. The main feature of the scheme was that the District Local Board and the Nadiád Agricultural Association were to jointly form the District Advisory Agricultural Council. The Táluka Boards were to form the real Working Agricultural Committees. To provide for the want of representative agriculturists on the Boards, which, under the constitution to be hereafter formed, may not consist of such people, it was proposed to empower the Táluka Boards to add to their number members likely to be practically useful to them. The Advisory Council was to be a medium between the Government Agricultural Department and the Táluka Agricultural Committee, who, in their turn, were to be practical instructors and mediums of communication with the village agriculturists of all information and knowledge conveyed to them, through the District Local Boards by the Government Agricultural Department. As above stated, the scheme, however, was submitted by the President, Mr. Wood, to the District Local Board, who, on the motion of the Huzúr Treasury Officer, declined to accept it on a mere sentimental objection. Mr. Wood was naturally seriously disappointed, and he remarked at the end: "Here is the result of our one week's hard work." I may mention by the way that, though President, he scrupulously respected the opinions of others, and allowed the growth of independence without unnecessary interference. This scheme, gentlemen, seems to be very practical, and if it recommends itself to you, I place it before you for your consideration. The next question, gentlemen, is as to the supply of selected seeds. The Nadiád Agricultural Association tried the experiment of keeping a seed shop for over six years, I remember. For a time it seemed to work well, and we began to congratulate ourselves, but lately for want of proper management of the stores and care in the selection of seed, the stores became useless, rather worse than useless. One main, but not the less grave reason, was that we used to sell the seed rather cheap which demoralized some cultivators who used the grain for food instead of for sowing purposes. The good selected seed should be specially prepared and, as Mr. Keatinge just very truly remarked, consequently it can never sell at even current market rates, but must be sold at higher prices, as the special preparation and selection must necessarily be more costly. If the selected seed has to be popularised the excess of rate must be paid

for from a fund supplied rather by the Government Agricultural Department, or more properly by Trades Associations who are probably interested in the produce of the cultivators, such as wheat, cotton, etc. These trades people, though personally interested in this subject, have, to my knowledge, done very little to assist the cultivator in that direction. Any way the supply of good seed is a great necessity, as we all understand; and we must devise upon some plan whereby selected seed-stores may be popularised and at the same time prevented from abuse. (In answer to the Chairman the speaker proceeded thus.) The selection of seed not having been properly made the seed was used by the cultivator as food-stuff. For sowing purposes the cultivator generally bought ordinary food-grain. The selection of seed cannot be done by the poor cultivator. That work must be done for him by other people; the Agricultural Department should do that work. Then the cultivator will be able to raise good wheat or cotton. The cultivator ought to know where he can get good seed. At present the seeds are obtained at the eleventh hour; then good seed is not to be had in the bazar and therefore cotton has deteriorated.

Mr. A. M. Bidikar (of Belgaum) said:—Mr. Chairman and gentlemen,—Thanking Government for what they have done in the matter of the diffusion of agricultural knowledge to the cultivators, I think it is out of the power of Government to diffuse it to such an extent as would reach it to the majority of them. It would also be a matter of very great expense for Government to establish farms for the experiment of all the principal crops that are grown in this Presidency, where land in every few miles, if not in every few hundred yards, differs very materially in its constituents. The modes of cultivation too are different in different localities. It would be highly interesting and profitable to know what ways of cultivation are comparatively more profitable and whether the more profitable ways can be made applicable in other places, and if not Government should ascertain the reasons thereof and find out the way to make them applicable. For instance in many places in the Belgaum District, transplanting of rice is not resorted to; some people give unsuitability of soil, others want of labour and so on, as the reasons thereof. Which of these is true? If the former is not true the rayats can be induced to have recourse to take up the more profitable mode of transplantation. Under such circumstances it is necessary to find out a remedy to multiply as many farms as possible within the amount which Government is prepared to spend. The remedy that I propose is the one that suggested to me from the policy pursued by Government in its Educational Department where it has aided as many schools as it found willing and efficient to carry out the work of education according to the Government standard. During the last few years people of some education have taken up to agriculture and the tendency of the present time seems to be for the landholders of the educated type to seek means to increase the produce of their lands by improvements in the modes of cultivation and otherwise. I would instance the example of the *Rajásáheb* of *Mudhol* in this direction, whose example should be followed by other landholders, great or small. This being the state of things I propose that Government may, wherever possible, take advantage of this state of things and establish a number of aided farms. I would suggest a few outlines for these. Such farms should be established at places where the constituents of the land and the modes of cultivation vary and where new crops and new agricultural industries seem possible. I would cite, for instance, *Bastwad* or some other place near about Belgaum, where sericulture is possible, or some places in the *Chikodi Taluka*, where castor is, and can be, grown, and where, in addition to the experiments in ordinary field and garden crops, sericulture and ericulture can be tried. The advantages of such a system will be—

- (1) Government will get a person intelligent enough to try experiments decided upon by them.
- (2) This will give a tendency to cultivators to try experiments of their own accord.
- (3) The number of farms can be increased within the amount intended to be spent on experiments in a district.
- (4) People will have greater opportunities of seeing these experiments.

(5) It is a known fact that ordinary cultivators fight shy of Government farms and when told to try the methods which have been found useful on Government farms, they generally say that the means at the disposal of Government are large and that they cannot follow these methods of cultivation with profit. This would not be the case when these experiments are carried on by private persons.

(6) If to such a farm are attached half a dozen students of agricultural classes or of the criminal classes, such as Berads, etc., at a stipend of one or two rupees a month the objects of primary education may also be gained. (I learn from the Deputy Director of Agriculture, Mr. T. F. Main, that such a system is in vogue in the Baroda State for the Bhils and works well.) Having stated a few of the objects that may be gained by the establishment of the aided farms in this Presidency I would place for consideration some suggestions as to what considerations should weigh in preferring persons for grant-in-aid.

(1) The person should be the owner of the farm or should be the holder of a long lease.

(2) He should be sufficiently educated to be able to follow the instructions issued by the Agricultural Department or given verbally by Government experts and should be able to keep notes of such experiments.

(3) He should keep a certain portion of land for experimental purposes and should be prepared to carry on these experiments.

(4) The owner of lands both agricultural and horticultural should be preferred, as both the experiments can be tried by one person.

In case such persons are available, and I believe they will be, they should be given such aid as Government thinks fit.

In order that Government should be satisfied that the object of aiding such farms is gained it should be decided that the amount fixed as aid should be given quarterly after the Director of Agriculture is satisfied that such experiments are carried on by the farmer.

Mr. G. F. Keatinge, Director of Agriculture, said :—Gentlemen,—From the remarks which were made by the speakers yesterday and today and from the letters which I have received from a number of gentlemen all over the Presidency, it seems to me that there is a general opinion that steps should be taken to increase agricultural education, to extend demonstration plots and to provide selected seed for cultivators in the Presidency. So far as the Educational Department was concerned, the Director of Public Instruction has already told us that they had not the establishment which would enable them to undertake the extension of agricultural education in primary schools. That gentleman has also suggested that the Agricultural Department should undertake that work. In this connection I must confess that at present we have not the trained establishment which will enable us to make a very extended advance in this direction. At the present moment we have made many new departures with an extremely junior staff. I may mention one of our experimental farms, where the Superintendent has got two years' service and his assistants only a few months' service. Both are extremely capable and intelligent officers; but they are only boys at present and we cannot expect junior men to organise and undertake much new work, otherwise we may bring discredit on the Department by having people in charge who have not had sufficient experience of the work to obtain successful results. In the course of a few years we shall, no doubt, have a much larger trained staff and shall be able to make a decided advance. At present we can depend on a limited staff and do the work to a limited extent. If suitable conditions are found to exist, including the support of the public, we shall deal with larger questions. Take, for example, such questions as the selection, storing and supplying to the cultivators seeds of different kinds. I think any one, who will consider these points carefully, will see what an enormous seed business there is in the country. Each kind of seed grain requires to be separately grown, carefully selected and carefully stored and this must be separately done for each tract. In other countries there are seedsmen in every

small town and rural district who make a profit out of this business. They grow selected seed, store it and sell it to the farmers. When carefully selected and stored seed is to be given to the cultivators, I think it would be reasonable to charge more for it to ensure of its not being used for food. It is suggested that cultivators cannot afford to purchase selected seed. I suggest that he cannot afford not to purchase it. Suppose the bazar seed is sold at 4 annas selected seed might be sold for 6 annas and it is worth that, because none of it has lost its germinating capacity. He cannot afford to go without good seed; and he has to pay the additional two annas. It must be a very long time before we are in a position to sell seed to everybody. To extend our work we require strong local support from individuals and from associations. We want to receive assistance and we want to give assistance. In some places we have still to make a start. We have done very little in Ratnágiri and the Konkan. We must, in the course of time, extend our operations there, and, personally speaking, I may say that one of the districts in which I wish to start a new farm is the Ratnágiri District.

Mr. Nathabhai Avichaldas of Vankaner said:—Mr. Chairman and gentlemen,—We have to deal with the question of agricultural education in a scientific way. I think to give scientific agricultural knowledge we will take at least some years. In the meantime we must see what practical work we can do for the improvement of the agriculturists who are quite uneducated. Of course, they have rudimentary knowledge of agriculture; they know what crops are good for what lands, and they also know the value of manure; they have general knowledge of the subject. In order to make that knowledge a scientific one practical demonstration farms should be tried. But as that will take some time to be practicable, at present we must give more practical knowledge to the cultivators in their own homes. Cultivators know that selected seed should be sown; this seed they very often select out of their own crop. If they cannot get good seed from their own crop they either borrow it from their relations or from the Bania, who has a mixed kind of seed. With regard to the quality of seed the best seed sown gives very good results. What should be done is that the Agricultural Department should select certain number of villas where agricultural instruction should be given to the cultivators. The Superintendents of the Agricultural Department should go to the farms and give lectures. In this way, in course of time, a very substantial change will be made in the knowledge of the cultivators as to the selection of seed. During that time scientific training will be provided for the cultivators. Agricultural experts should be sent to the villages in time of harvest to give instructions as to which seeds should be selected. This will be done gradually. It cannot be done all at once.

Mr. Bhimbhai Morarji, Divisional Inspector of Agriculture, N. D., said as follows:—Mr. Chairman and gentlemen,—I recently visited the Mandvi Schools, which are meant only for training the sons and daughters of Bhils. These two schools are working for nearly 20 years past. There are 106 boys in the Boys' School and about 80 girls in the Girls' School which is by the side of the former. There is a farm attached to the Boys' School extending over 35 acres. There is also a workshop attached to that school. To the Girls' School they have attached some sort of home industries in addition to the out-door work that the girls do in fields along with the boys. These home industries consist of lace-work, knitting-work, etc.; some of this education is not very suitable for Bhil girls. The farm is managed under the supervision of the Head Master of the Baroda School. There is a *Maistri* attached to the farm on a salary of Rs. 25 only. They have got regular hours for out-door work in the farm and for lectures in the school. The farm has up to now paid nearly Rs. 22,000 to the State. I saw the boys working with the ploughs and I was very satisfied to see that they were doing better work than is done by some of the other low caste people. These Bhil boys are taught everything from the beginning. They enter the school at the age of 7 or 8 and leave it when they are about 18 years old. In the beginning a boy is told to remove weeds, etc. From that point his education in the school commences. Gradually he is made to work with the plough, and it is only when he is 16 years of age that he is given heavy work to do. Out of the 97 students who have hitherto passed through

this course, 60 have employed themselves in agriculture proper. I have seen one or two of these females. I find that they are given similar work to the one ordinarily done by coolies and that they work better than the *Dublas*. When the boys go out of this school, each of them is given Rs. 60 to purchase bullocks and settle in life. Rs. 10 is also paid him to purchase implements. The farm is very well managed up till now.

The Honourable the Chief of Ichalkaranji said:—Mr. Chairman and gentlemen,—Government themselves cannot afford to do much in the matter. For this purpose, I think it would be desirable for Government officers to approach landlords and see whether they would not be ready to give some land—not exactly at the disposal of the Government—where seed could be sown or stored and everything is done under the supervision of a Government officer. I think something of this sort has been tried in the Sind District. I do not know why it cannot be done here. I told Mr. Keatinge that I am perfectly ready to put some farms in two of my talukas at the disposal of the Government. If the people are approached in a proper manner, I think they would be too willing to assist Government in this respect; first, because it would not entail any great expenditure on them, and secondly because, if the experiment is successful, it would, I think, be readily adopted by the cultivators. I am sure any amount of expenditure that would be incurred on the farm would be more than recouped. There is another point on which I want to say something, and it is about the selection of seed. We have heard here something about this subject. I think the authorities concerned with this subject know better about it than an ordinary layman is supposed to know. My idea is that at least in my part of the country the selection of seed is not done so haphazardly as it is supposed to be. The rayats know well all about the selection of seed. They are very careful in making the selection. If they cannot have good seed from their own fields they borrow it from the Bania. The defect seems to be in the tendency of the cultivators to sow the same seed in the same land for years together. They must be told what benefits accrue if the seeds are transplanted, say, from Poona to some other territory. I would point out that the cultivators, when they see that the results of transplanting are profitable, are not very loath to adopt better seeds and new methods of planting also. I know in my part of the country they have improved the quality of sugarcane vastly; formerly it was white, then they came to red, and from red they have come to the present sort. During the last 20 years there have been from three to twenty changes in the quality. The same may be said of groundnuts. Until very recently local groundnut only was sown; for some years this article suffered from a disease which made its quality to deteriorate. Somebody, however, lately introduced the American seed—they call it Burmah seed—and now people have largely taken to it. It is satisfactorily introduced in the Southern Marátha Country. This shows that when people know that a good crop can be had from a particular seed, they are only too eager to adopt it and discontinue the one they used before.

Mr. T. F. Main, Deputy Director of Agriculture, said:—Mr. Chairman and gentlemen,—One of the subjects discussed here today is seed selection. This is a question in which I am particularly interested because in the present stage of development in Indian Agriculture I do not think there is any line of work which the Agricultural Department can devote itself to better than seed selection. It seems to me that gentlemen have discussed this question from the middle instead of from the beginning. We have heard a lot of seed stores, but I should like to know from where these are to be fed. I think it is only the Agricultural Department which can do this work. On our experimental farms we should produce and develop improved seed, and having effected this improvement we should have a nucleus for increasing this seed. By a nucleus I mean a seed farm where we can multiply the improved seed up to a certain point; having done that I think we should get selected cultivators to still further increase this seed and if possible distribute it among other cultivators. I think it is an accepted fact that improved seed in time deteriorates if not constantly selected and hence I think it all the more necessary to have seed farms whence the seed store can regularly be replenished. I think the only way to supply seed stores is for Government to establish seed farms. As a

specific instance of what I mean I may mention Khándesh cotton. Professor Gammie has shown that the Deshi cotton of Khándesh consists of a mixture of about 6 types. One among these types possesses a much higher ginning percentage than the others. I am at present growing these types separately and it is evident that an advantage of about 6 per cent. in the ginning percentage can be obtained by substituting the best of these types for the present mixture. I should like to increase this cotton and distribute it all over the district.

Mr. Jagdevrao Nimbalkar of Phaltan said:—Mr. Chairman and gentlemen,—The effect of good seed does not depend merely on its selection but on the climate and water of the place where it is sown. When education is given to the sons of the agriculturists the importance of the seed in all these respects should be impressed on their minds. Seed should be transplanted in different places at certain intervals. If you replant the same seed on the same soil for three years consecutively, it will not give you good harvest. Veterinary subjects should also be taught to the sons of agriculturists in their schools, so that they may be prepared to cope with cattle-diseases. For practical purposes farms should be attached to the agricultural schools, in talukas where the farms are available. You should have at least one farm in each district. The course of studies in schools, intended for the sons of the agriculturists, should last for 3 or 4 years, in order that they may acquire all the practical knowledge that is necessary for their profession, e.g., how to prepare the land, how to sow the seed, how to raise the crop, how to select the seed, how to select the climate, how to select the water, etc. Climate, land, seed, manure and good rain are among the essentials for having good crops.

Mr. W. Burns, Economic Botanist, said:—Mr. Chairman and gentlemen, I am glad to hear the remarks of the Chief of Ichalkaranji as to the help which landed proprietors can give to the Agricultural Department in experimental work. As an example of what has been done I may mention that a public spirited gentleman of Násik has put at our disposal 100 vines on which to experiment as to the remedies for mildew. Experiments made actually in the centre of the district where a crop is grown are the most conclusive.

Mr. S. G. Paregaonkar, Honorary Secretary, Sangamner Agricultural Association, said:—Mr. Chairman and gentlemen,—The regulations which govern the conduct of Local Board business contain a schedule which clearly shows that agricultural research and improvement is one of the matters on which Local Boards may properly expend their funds. What I have to do is to draw the attention of the Presidents of the District Local Boards to this item. (Reads the several heads of expenditure which may be incurred by Local Boards.) Therefore, I wish to move that this Conference should move a resolution in which Government should invite the attention of the Presidents of District and Taluka Local Boards and other officers concerned to that item. The second resolution that I shall propose is "That in the opinion of this Conference Government should establish in each taluka an agricultural station to demonstrate to the cultivators the advantage of improved cultivation by scientific methods, attaching to each a store for the supply of such selected seed, implements and artificial manure, as can be shown to be of profit to the locality, that trained agriculturists should be attached to each such station, and that the aim shall be to open at each station in the course of time a class for the instruction of cultivators' sons." Resolution No. 3 would be as follows: "That this Conference is of opinion that such a scheme would receive much local support from landholders and that preference should be given in the beginning to localities where a strong committee may be found to start the undertaking, provide land, raise subscriptions and furnish assistance." The fourth resolution I would like to move is "That this Conference resolves to invite the attention of the Presidents of the District and Taluka Boards to their powers and obligations to provide funds for agricultural education and development."

The Honourable Báb Bahádur Rodda:—I beg to second the Resolutions.

The Honourable Sir John Muir Mackenzie (Chairman):—It is with great satisfaction that I put these resolutions to the Conference, which will

serve as the basis of recommendations upon which Government may be able to take action.

There is not likely to be much objection taken to the proposal that there should be a demonstration farm in every taluka. That is an objective which may quite properly be worked up to; but it will take time and money. Similarly there is little objection to be taken to the principle affirmed in the second resolution. As regards the third it is easy to invite the attention of Local Boards to their powers to spend money on agricultural objects. The real difficulty lies in the Boards finding the funds. There was a time when even the Provincial Government was reluctant to allot money for agricultural purposes. That time however is passed and everywhere the desirability of assisting agricultural work with money is recognised. Local Boards will be just as well disposed as any other responsible body. But until the resources of the Boards are increased it is vain, I fear, to hope that they will have money to give to any very large extent. And it is difficult to see whence the Boards will derive additional resources unless they take powers to increase local taxation. It is for the Boards to ask for these powers.

Mr. J. B. Knight, Professor of Agriculture, said:—Mr. Chairman and gentlemen,—So far as the Shrigonda Táluka is considered, it would be wise to have a demonstration farm there. We have made efforts in this direction in Nagar; we have there a demonstration being carried on in connection with the Nagar Agricultural Association. Our operations there are in an experimental stage. I would just say one word in reply to the Chief of Ichalkaranji. We have tried his method quite extensively in Southern Sátára. There we have taken up pieces of lands; the cultivators carry on the work there, the Agricultural Department furnishing certain expenses. There are demonstrations there of groundnuts, sugarcane, manure and these demonstrations are going on there without any expenses to the Department. [At this stage the Chairman left his seat which was occupied by Mr. Keatinge.] We would like to carry on the experiments in other places.

R. V. Shringarpure (of Panvel) said:—With regard to the Resolution I may say that there should be seed depôts in every táluka and that from these depôts seed should be sold to cultivators. The depôts should be under the direct supervision of Mámlatdárs. The Agricultural Department also should have supervision over them. Experimental and model farms may be situated in the Ratnágiri District. Better still, I would suggest they should be in the Kolába District, because it is approached both by the steamer and railway communication and is close to the Ratnágiri Táluka. A model farm situated in the Kolába District will afford equal benefits to the Ratnágiri District.

The Honourable Eáo Bahádur S. K. Rodda said:—Mr. Chairman and gentlemen,—It is with the greatest pleasure I beg to second this Resolution. It is the duty of the Local Boards to provide funds for agricultural farms as well as for agricultural demonstrations. Up to now not a single pie has been spent by them on these matters. There are dispensaries and other things for which grants have been recommended. I myself have brought these matters to the notice of the Local Boards. I suggest that this Conference should take this opportunity to throw this question open for the consideration of the District and Local Boards who will be quite glad to give every assistance for demonstration and experimental farms. They should not touch the existing model farms, because they are maintained by Government at a very great cost. The additional grants which the Local Boards may sanction may be for village-demonstrations or táluka demonstration farms, because in big centres Government has spent and can spend anything. The Local Boards are poor and they are hampered for funds; therefore, for these village and táluka experimental farms, we should request the Government of India to help the Local Boards. The question of seed is a very difficult question. The cultivator ought to be taught how to gather seed, and how to preserve it. He does not know that the same seed, if sown on the same land for a number of years, will deteriorate. When a cultivator wants seed he goes to the Bania and buys the seed which has deteriorated in quality. Seed depôts should be started to avoid the mischief arising from the cultivator having to sow bad seed. I think this seed question

should be entirely left to the Agricultural Department. It should co-operate with the Agricultural Associations in distributing seed to the cultivators in different villages. The Associations have great influence with the ryots and, therefore, can induce them to take seed from the Agricultural Department. This is necessary because the ryots do not sometimes know where the good seed is available, what is good seed, what is the nature of the soil where the seed is to be sown, and so on. To enlighten the ryots on these points local assistance is required by the Agricultural Department.

The Chairman then put the proposition to the meeting :—

“That this Conference should invite the attention of the Presidents of the District Local Boards and other officers concerned to their duties and powers and obligations in respect of the encouragement of agricultural improvements.”

The Resolution was declared to be passed.

Some economic factors in the agricultural situation were then discussed.

ECONOMIC

An *interim* report by the Special Officer in charge of the experimental loan scheme for financing sugarcane cultivation on lands commanded by the Nira Canal—Mr. B. B. Sahasrabudhe—was placed in the hands of the Conference.

Mr. J. Brander, Assistant Collector, Poona, said :—Some years ago it was observed that the sugarcane cultivators on the Nira Canal experienced great difficulties as regards the financing of the cultivation, procuring manure, and marketing the produce. Most of the capital was supplied by local *sāvkar*s. Interest averaged 12 to 18 per cent. Cultivators could not obtain at a given time all the money then needed, but had to take it in dribbles as the *sāvkar*s got in his dues. Often the *sāvkar*s had no funds to advance for planting the new crop till he sold the jagri of the old crop in March or April. Sugarcane to give the best return should be planted in January. Heavy loss therefore occurred from late planting. Large amounts of oil-cake manure are needed. The *sāvkar*s bought oil-cake wholesale and advanced it to their clients as a loan, charging high prices. Sometimes oil-cake was adulterated, and it was often suspected that short weight was given. The clients, however, living as they do in distant villages had no means of checking quality or weight. Lastly the jagri was sent to the *sāvkar*'s shop at Baramati. The *sāvkar* acting as a broker sold it to wholesale buyers. The client had to take the *sāvkar*'s word as to the weight of jagri received. Prices vary much and if a *sāvkar* sold when prices were high and told his client that the sale occurred when prices were low, the client was helpless. At the end of the year the *sāvkar* after deducting charges for interest, oil-cake and jagri brokerage, handed over the balance to the client. Thus the cultivators, mostly illiterate, were dependent on the *sāvkar*s at every point. They remained in a far from prosperous condition while the *sāvkar*s piled up riches. How the cultivators suffer loss in their accounts with *sāvkar*s, and how inadequate the *sāvkar* system is for supplying money timely and sufficiently, are shewn in the Special Officer's report.

In 1905 the shortage of capital and the inadequacy of the *sāvkar* system reached a crisis. Locusts in 1904 destroyed four-fifths of the sugarcane crop, the *sāvkar*s failed to recoup their advances and were often unable to finance cultivators for the new crop. The result was a drop in sugarcane from 7,000 to 5,200 acres. Had a bank with ample resources in capital been in existence, it would have financed the new crop without hesitation, even though advances due had not been repaid, well knowing that both old and new advances would be easily repaid from the proceeds of the crops of the next two or three years, the loss being thus spread over some years and so borne by the cultivators without difficulty.

In 1905 a meeting was held at Baramati, at which many of the chief *sāvkar*s and cultivators were present, and a unanimous desire was expressed by both

classes for the foundation of a bank to finance the sugarcane cultivation and remove the existing difficulties. Many *sāvkārs* grow sugarcane themselves and so are interested in obtaining cheap capital.

To meet fully the needs of the cultivators the bank or other financing agency would have to supply loans and manure and to be the marketing agency. Sir Frederick Nicholson in his invaluable report on Land and Agricultural Banks says:—"Probably the heaviest terms in the way of interest are found in this form of credit (brokers and producers). The brokers are chiefly found in the tracts of special produce such as cotton, jaggery, indigo. The immensely valuable black cotton tracts of the Madras Presidency are exploited by these men; the palmyra tracts of the extreme south are chiefly worked by them, so that the ignorant Shanar population gain little by the immense increase in prices and demand. If banks are to succeed they must be so organized as to take up produce brokerage at least in the special produce tracts. They must not be merely lending banks. Ryots can seldom manage to dispose of their own cotton and jaggery direct to merchants, they must have a middleman and this 'daughter of the horse-leech' is ever grasping at more and more of the profits of trade." It was seen that there was no hope of the Nira cultivators being themselves ever able to shake off this monopoly, or to organize co-operative associations for the purpose. Government would have to introduce or create some institution for the purpose. In considering the line of action to be taken it was found that there is no lack of precedent for Governmental action in supplying capital to agriculture and marketing produce. Many years ago the Dutch Government in Java advanced money to capitalists for the production of high class crops, such as sugarcane, and these capitalists got the crops grown by the cultivators. The Government took over and disposed of the produce. All concerned—Government, capitalists, cultivators—are said to have attained a high pitch of prosperity. The Indian Government makes advances to cultivators for growing opium and takes over and disposes of the produce. Thus the exactions of *sāvkārs* and brokers are eliminated. The principle at the base of such administrative action is that high class cultivation requiring much capital cannot be properly developed in an eastern country by a peasantry with small resources, except by means of an organized system for financing the same. Above all, the striking success of the Agricultural Bank in Egypt, where the cultivation is all under irrigation, chiefly perennial, has shewn that, under certain special circumstances and granted certain facilities, the problem hitherto deemed insoluble of applying joint-stock banking capital to agriculture, with safety and profit to both borrowers and lenders, can be solved. These special circumstances are as follows:—Firstly, a large amount of capital must be constantly in demand for producing valuable export crops. This is the case as regards cotton in Egypt and sugarcane on the Nira. There is little genuine demand or need in Oriental countries for outside capital on a large scale for purely subsistence cultivation, and therefore no outside bank can be successful in financing such directly. Secondly, these valuable export crops must be protected from crop failure, either by unfailing rainfall, or as in Egypt and on the Nira Canal by irrigation. Thirdly, certain administrative or legal facilities are necessary. The Agricultural Bank of Egypt and the Nira Tagái Scheme possess these.

By instituting the present Tagái Scheme, Government have followed the same line of evolution as resulted in Egypt in the creation of the Agricultural Bank; so the origin of that Bank will be briefly described here. The aim which took shape in the mind of the Egyptian Government was rather that of freeing the cultivators from debt than that of financing the cultivation. Lord Cromer wished that respectable banks should enter the field then exclusively occupied by money-lenders. With the object of inducing banks to do so the Government advanced £10,000 in 11 villages as an experiment. The experiment was most successful. The whole of the principal and interest except £20 was repaid within the year. Lord Cromer arranged for the National Bank to take up the business. The instalments were entered in the revenue accounts and collected by the village accountants. Till it was seen whether the experiment would succeed, operations were confined to one district.

Lord Cromer pointed out that Government alone could not take up banking business: firstly, because Government could not provide the necessary capital; secondly, because Government officials have no personal pecuniary interest, would be negligent, and would fail to push the business so as to oust the money-lender. What was wanted was that trustworthy agents should seek out clients and personally explain to them the advantages of the system. On the other hand, the disadvantage of purely private enterprise was that no bank could maintain the agency needed to collect the instalments due on a very large number of petty loan operations except at prohibitive expense. The following plan, combining the advantages and obviating the disadvantages of the two systems and establishing a certain amount of co-operation between the Government and the Bank, was adopted. The Bank incurred the whole financial responsibility, took all the profits, bore all the losses and through its own agents did all the work of lending. Local agents were appointed and put under the supervision of an English Inspector (Mr. Scott Dalgleish, now the Manager of the Agricultural Bank of Egypt). Lord Cromer drew particular attention to this detail, saying the success was mainly due to the fact that Mr. Scott Dalgleish constantly visited the villages, spoke Arabic well, thoroughly understood the nature and custom of the people, was thus able to control the agents, both in the interests of the Bank and the borrowers, and to explain everything verbally to the latter. It was only at the stage of repayment that Government stepped in. The tax gatherers collected the Bank's money at the same time as the land tax, thus relieving the Bank of all expenses of collection. Money was advanced at 10 per cent., of which 1 per cent. was commission to local agents. Of the remaining 9 per cent., 5 per cent., it was estimated, went to cover the Bank's expenses, leaving a net profit of 6 per cent., from which, however, bad debts, if any, had to be deducted.

The National Bank succeeded so well that in 1900 operations were extended to ten districts. The whole of the dues in 1900 were recovered. The Bank officials stated that there was nothing to indicate that the cultivators, once freed from the money-lenders, were inclined to plunge again into debt beyond the debt to the Bank.

In 1902 the Agricultural Bank of Egypt was started under the auspices of the National Bank and took over all loans outstanding with the National Bank. Interest was lowered to 9 per cent. Fresh capital was raised. Government gave a special guarantee which enabled capital to be raised on easy terms. Lord Cromer pointed out that the chief reasons for the success are twofold, namely, (1) that though the intention of Government is philanthropic the undertaking has in no sense been established on a philanthropic but on a strictly commercial basis. At first there was some difficulty in convincing capitalists that the business would be fairly lucrative; but, when by applying actual experiment this difficulty was overcome, the main obstacle to success was removed. (2) The supervision, which has been conducted by very carefully selected British agents, has been capable, vigilant and honest.

No questions are asked as to the object of the loans. Loans up to Rs. 300 are given on simple receipt, to an amount not exceeding 3 times the borrowers' assessment. Loans from Rs. 150 to Rs. 7,700 are given, taking a first mortgage of irrigated land of a value of at least twice the sum advanced. Collection of the Bank's dues is made by the village accountants. By agreement with Government all payments made by the cultivators at revenue collection time are first credited to the Bank. If there is any deficit in the total collections made on account of Bank's dues and assessment, the village officers seize the crop for the deficit. Thus the Bank obtains an inexpensive and effective method of recovery. Government incurs no loss, for ultimately any deficit in the total collections on account of the Bank's dues and assessment which sale of the crops attached fails to meet is imputed by adjustment of accounts to the Bank. An agriculturist has as a rule only two forms of security to offer—crop and land. Neither is any use to a Bank unless it can in case of default be realized at once in hard cash without delay or expense. By the method just described the crop can be at once realized and so forms a valuable security for the Bank. Secondly, all the larger loans, forming the bulk, 84 per cent. of the total capital lent, are secured on first mortgage of land, and by the ordinary law

of Egypt the land can, in case of default, be sold by the mortgagee, *i. e.*, the Bank, for its dues, without the intervention of the Civil Court, just like mortgaged property in the Presidency towns and in England. The land is thus a valuable security to the Bank, being so readily realizable in cash. If a civil suit with its expense, delay and opportunities for evasion had to be brought in each case of arrears, banking business would be impossible. The borrower's protection is in fact not the judiciary but his freedom of contract, the high character and repute of the Bank and the general executive supervision of Government over the Bank's policy.

The Bank at one time stored the cultivator's cotton, but does not now touch the produce at all, as the Egyptian cultivator's opportunities of disposing of his produce are many and easy. He is in close touch with European merchants and not so much at the mercy of usurious middlemen as the Indian ryot. The Bank has arranged for an Agricultural Association to supply the clients with chemical manure, the price being debited as a loan made by the bank.

The Bank had, in 1909, $12\frac{1}{2}$ crores of rupees lent out to cultivators. Egypt is immensely prosperous. The wages of the labourer have risen from $2\frac{1}{2}$ to $12\frac{1}{2}$ annas a day. The prosperity is chiefly due to extension of perennial irrigation, but must also be due to the fact that so much banking capital is being productively used by the cultivators.

At the instance of Sir John Muir Mackenzie it was decided to advance two lakhs per annum as an experiment to sugarcane cultivators, beginning from 1908. The main object was to demonstrate the possibility of a bank undertaking business on the Nira Canal. Mr. Sahasrabudhe, who as Mamlatdár had taken great interest in the cultivators and won their confidence, was made Special Officer. The methods and results of the operations up to June 1909 are described in his report. I therefore refer only briefly to the more important points.

Loans are given, in two instalments, to finance the crop from start to finish. Also short-term loans in one instalment are given for particular items of cultivating expenses. The security is generally the land with the crop. In some cases, when the client had merely rented land and had no land of his own, the security taken was the crop *plus* the personal security of some well-to-do person. Before the second instalment of long-term loans is advanced the crop is inspected to see that it is in good condition and that the first instalment has been properly utilized. The clients under agreement to do so send their jagri to the Government shop where it is sold by auction to outside buyers. This is convenient both for clients and also for recovering the loans. The brokerage charge is 2 annas a *palla*, *i. e.*, about 0.7 per cent. on the selling price. The shop is managed by an agent, himself a landowner and sugarcane grower. The Special Officer supervises it closely. Besides clients, the jagri of other persons was taken in and sold for them. This was a great convenience to them. Oil-cake of excellent quality was bought wholesale by the Special Officer, both locally and from Gujarát, and sold to the clients at cost price, they being advanced loans to buy it. Exact accounts are rendered promptly to each client as to the jagri received, the prices obtained, and the balance due to him, and he has every opportunity to check the weights of jagri and oil-cake if he desires. All this has popularised the operations.

As regards the financial results of the first crop year, 1908-09, these will not be definitely known till December. Two unusual circumstances, namely, the occurrence of sporadic cholera and the early onset of the monsoon, scattered labourers; so crops representing loans of Rs. 36,778 remain to be crushed from October onwards. The crops are reported in excellent condition. Besides interest, Rs. 2,25,689 principal was recovered out of the Rs. 2,66,500 principal due for payment before June 30th of this year. Only Rs. 3,165 remained on 31st July to be recovered from clients who had no crops at all or no crops remaining to be crushed. The majority of these men have been financed for the new crop, and no difficulty is anticipated in recovering both old and new loans from them in due course. Late planting was the cause of the comparatively few cases of crop failure. In future no loans will be given for crops that are to be planted late. Also, the Irrigation Department have now given

facilities for early planting. Crop failure from this cause will therefore not occur in future. No difficulty is expected in recovering the loans from those persons whose crops failed but who have not been financed for the fresh crop.

It is to be regretted that the actual financial results of the first crop year cannot be known till December. From the collections already made, however, it can be anticipated that the results will be good. The Rs. 3,165 arrears referred to are of course amply covered by security.

The estimated surplus earnings of interest due up to 30th June 1909 (*vide* paragraph 11 of the report) that will remain after paying all establishment and other charges, and the $3\frac{1}{2}$ per cent. interest charge of the Government of India on the capital employed, would be Rs. 5,936, *i. e.*, about 2 per cent. on the loan capital. With the same establishment a much larger loan business could be done and profits would increase without expenses increasing. The scheme, however, is not run to make a profit and is limited to strictly experimental proportions. From the experience gained it is clear that a bank could without a large establishment do a very much larger business than Government has attempted and that the excess of income over the bank's expenditure is likely to be very good.

The satisfactory collections are due to the following:— firstly, the very profitable nature of the cultivation and genuine desire to use the loans productively. The average profit of the Government clients is calculated to be Rs. 150 per acre. In many cases it is much more. It has been calculated that by being clients of Government instead of *sávkárs* the cost of production per acre is reduced and so the cultivator's profits are increased by Rs. 60 to 80 per acre. The client can thus repay without difficulty.

Secondly, the careful supervision by the Special Officer, his avoidance of applicants whose character or cultivating capacity is doubtful, the prestige of Government, and the knowledge of clients as to the powers of executive recovery possessed by Government, operate to prevent misapplication of loans. These powers of recovery have so far not been used; but they are always available. In possessing such powers the Tagái Scheme resembles the Agricultural Bank of Egypt, for the crop or jagri can be seized, and the land sold for arrears of loans without having to resort to the Civil Courts:

As happened in Egypt, so now the time has come to establish a bank on the Nira Canal to take over and develop the business in all its three branches. The Government $2\frac{1}{2}$ lákhs finance only about 500 acres sugarcane, whereas there are 7,000 acres on the canal. It appears probable that from 15 to 20 lákhs annually could be advanced. In addition, there are about 4,000 acres sugarcane on the Mutha Canal, grown under similar conditions as regards loans, supply of oil-cake and marketing. If the bank also financed the Mutha Canal cultivation another 7 to 10 lákhs annually would probably be taken up. But besides financing sugarcane the great field for agricultural development in the Nira Canal tract and therefore the likelihood of increased demand for loans are clear from the Special Officer's report. Irrigation without manure gives poor crop return and injures the soil. Want of manure is chiefly due to want of capital. On this canal there are about forty thousand acres irrigated crops other than sugarcane. Large amounts could be advanced for purchase of manure. A light railway from Dhond to Bárámati has been prospected, and when it is constructed, increased supplies of manure at cheap rates can be counted on. For want of capital by far the greater extent of the irrigated fields have never been levelled. Sloping fields require twice as much water as levelled fields. It has been calculated that fields can be levelled for an average sum of about Rs. 50 or 60 an acre. The bank could advance loans for land improvement of this kind, and thus it will be possible in time for the area of sugarcane and other crops to be almost doubled from the resulting economy in water. Much good land has gone out of cultivation from water logging. It has been found that a proper system of drains reclaims the land. When capital is forthcoming the land will be reclaimed. For cattle, agricultural implements, labour-saving machinery, capital is urgently required. It is reported that by using oil engine sugarcane crushers, one of which has been used

this season on the canal, the increase of net profit is Rs. 50 to 100 per acre, due to increase in output of juice and saving in crushing expenses. A crusher costs about Rs. 6,000. The bank could advance loans to buy them to individuals or groups of individuals. Often the cultivator could increase his profits by 20 per cent. if he had facilities for storing his jagri for some months against a rise in prices. The bank could erect godowns and store jagri at a reasonable rent.

The experience, both of Egypt and of the Nira Canal Tagái Scheme, shows there is no foundation for the prevalent notion that the debts of the cultivators will prevent them taking advantage of a bank. They can pay off their debts easily from their increased profits when clients of a bank. Besides, there is not much ancestral debt on the Nira Canal. The debts are mostly current ones, incurred and paid off yearly.

It may be mentioned that a proposal is on foot in Mauritius to establish a Government Agricultural Bank to finance the important sugarcane cultivation there. Indian sugarcane cultivation cannot dispense with similar equipment.

There is, however, a larger aspect than the merely local one. The successful institution of a bank on the Nira will lead to creation of similar banks in all the vast and rich tracts of India, where valuable export crops like wheat, cotton, sugarcane, jute, etc., are grown under irrigation or assured rainfall, *e.g.* the whole of Sind, the Punjáb, Northern India, and Madras Canals, the Central Provinces and Bengal. The irrigated area of India is I believe about 20 million acres, a vast field for banking enterprise. It is a truism that no country can develop either in agriculture or industries without a modern banking system. The whole immense development of industries, trade, manufactures and agriculture in England was due to and primarily caused by the invention of modern banking credit, the beginning of which was the foundation of the Bank of England in 1697. Prior to that date England was an undeveloped rural country with petty cottage industries only. The present rapid development of agriculture in Western Canada is only made possible by the fact that banks establish branches wherever settlers go. We have seen that by means of the timely supply of loans from a bank the cultivator's profits are largely increased. Agricultural development is thus stimulated and there arises an increased and constant demand for labour and manure, which can only be supplied by drawing on the great unirrigated tracts lying within a large radius of the irrigated areas. In this way after banks are established, large tracts of country not irrigated themselves will be protected from famine far better than now. This phenomenon is seen even now to a considerable extent on the Nira Canal every year, where the sugarcane fields give work to thousands of labourers coming from Poona and Sátára Districts and Phaltan State. Thus, the general creation of banks in the irrigated and special produce tracts will certainly increase enormously the agricultural wealth and prosperity of India as a whole.

Finally, of special interest is the fact that agricultural banking, combined with the policy of developing high class irrigation, provides the solution of the irrigation and the famine problem in Western India. That problem is as follows. The Irrigation Commission in 1901 concluded that, though the Deccan requires protection by irrigation more than any other part of India, Deccan irrigation works could never pay the interest on their capital cost owing to their great cost of construction; so they must be constructed as protective works, *i.e.*, out of the limited and fluctuating amounts which can be spared from time to time from current revenues. They cannot be constructed out of loan capital as productive works. The Irrigation Commission added:—"If Deccan works could be made to pay there would be no limit to the funds which successive Governments of India would readily devote to their multiplication." Since, however, the delivery of this adverse verdict the net revenue of the Nira Canal owing to development of sugarcane cultivation is now not far from paying point. Mr. Visveswaraya prepared a project for increased storage in the Mutha Canal and shewed that by devoting most of the water to sugarcane irrigation and charging at Rs. 40 per acre, the rate now paid on the Mutha Canal, a net revenue of $6\frac{1}{2}$ per cent., can be obtained on the Mutha Canal. About 350,000 tons of sugar are imported annually into India, owing to the insufficiency of home production. The

enormous scope for the expansion of Indian sugar production is thus apparent. The future Deccan Canals with their cheap labour, unfailing water-supply, good facilities for obtaining manure and closeness to markets, appear a splendid field for growing sugarcane on a large scale. By means of banks the cultivator's ordinary profits from sugarcane can be increased by Rs. 60 an acre as explained already; also when power-crushers purchased by loans obtained from the bank are in general use the profits will increase by Rs. 50 to 100 per acre more. Also with banking capital available the full area possible of sugarcane can soon be obtained. Sugarcane cultivation financed by banks will in fact prove a regular gold mine for the Deccan. Financed in this way the cultivators on the new canals could easily pay a duty of Rs. 40 an acre; the net revenue of the canals will then exceed the interest on the cost of construction, and the fact that Deccan canals can be constructed on the productive basis will be established. Ample loan capital should then be forthcoming to construct many canals speedily. Thus, the splendid and entirely practicable prospect is opened up of converting large tracts of the famine-stricken Deccan at no very remote time into something like a second Egypt as regards agricultural wealth.

Mr. Anupram Kirparam (of Surat) said:—Mr. Chairman, Sardárs and gentlemen,—About banking, I should say that cultivators can well be encouraged and assisted in case the benign Government guarantee to stand security for the repayment of their debts. Generally, we all know that the cultivator has to pay a very high rate of interest to the Bania. If debts of the cultivators or tenants were guaranteed to be recovered on the same basis as the *tagávi*, I think they will get money at a low rate of interest. With Government guarantee the banker will be able to lend, without any fear, the amount that the cultivator wants. One cannot lend money to the cultivator unless he is sure of getting a better security for its repayment. Under these circumstances, I earnestly request the benign Government to devise means by which the cultivator can get whatever money he wants from the banker at a low rate of interest. I hope the Government themselves will be pleased to stand security to the banker for the debt of the cultivator.

The Honourable Sir Vithaldas Damodar Thakersey said:—Mr. Chairman and gentlemen,—I did not intend to speak on this occasion on the banking question, because I thought it would be a repetition of what I have so often said before on the same subject. But as the question has been raised, I must say a few words in connection with what has fallen from the previous speaker. Gentlemen, so far as the experiments on the Nira Canal are concerned, we find they are as satisfactory as I expected them to be when they were first suggested. The suggestion was made by the Chairman of this Conference some two years ago, and then I had expressed my opinion that the experiments were bound to be successful. The idea of guaranteeing repayment of payments made to the agriculturists is, I think, out of the question. If the *sávkárs* or private individuals were to lend money to agriculturists, say, at 6 per cent., 7 per cent. or 9 per cent., which might be called a reasonable rate of interest, and if the Government have to guarantee the repayment of that loan, then it would be that the Government are themselves practically raising the loan at 9 per cent. because they are guaranteeing the loan which is to carry interest at the rate of 9 per cent. per annum. Why should the Government raise the money at 9 per cent. when their credit is good enough to raise it at $3\frac{1}{2}$ per cent.? They can raise it at $3\frac{1}{2}$ per cent. and lend it to the cultivator at 9 per cent. and keep $5\frac{1}{2}$ per cent. for reserve account and possibly for bad debts. [Goes into figures.] If we have to expect Government to guarantee loans, I would say that it would be better if they could give direct loans at the market rate and keep the rest of the money for the reserve fund. But we cannot expect them to make the loans, because those who are now talking of the "benign Government," would, when the time comes, tell people that the Government became the landlords of the whole of India. It is all very well, gentlemen, to say that the *sávkárs'* money must be guaranteed to be repaid, but the summary recovery of debts from poor cultivators may involve more hardship than is necessary for the safety of the *sávkárs*, who are quite capable of maintaining their own affairs as they best can. What we all desire is some institution that would help the agriculturists in co-operation with Government. We want the co-operation of the Government and not their

guarantee. Without repeating the recommendations I made before the Co-operative Credit Societies' Conference, held in Bombay some time ago, I would say this that I am very pleased to see that the Bombay Government have so far expressed their support to my scheme, and it is now left to the Government of India to say aye or no according to the advice they get. But I am quite sure that unless some means are devised—whether my scheme is supported by Government or another scheme is substituted for it, by which private individuals can come forward to give financial facilities to the agriculturists—it will be a very, very long time before our agriculturists will be able to improve their land, say, by the improved plough and mechanical machinery, and so on. With these words, gentlemen, I have to repeat that instead of expecting the Government to guarantee repayment of loans we must find out some means by which, with the co-operation of Government, we can deal with the agriculturists in any way by which they would be benefited without the bankers or the *sávkárs* taking any unnecessarily great risk.

The Honourable the Chief of Ichhalkaranji :—I hope you will give us some indication as to your idea of the co-operation of Government.

The Honourable Sir Vithaldas :—So far as the co-operation of the Government is concerned, there are two kinds of co-operation. I don't want to take much time of this Conference in narrating them in detail. One kind of co-operation was suggested at the last Conference. We find in Bombay, ordinarily in large centres of industries, 6 per cent. is the rate which people can easily secure without taking any extraordinary risk. That being so, why should bankers and *sávkárs* go and lend money at 6 per cent. or 7 per cent. to an individual agriculturist and why should they take all the risk of collecting the money? Then there would be a large cost for collection—1 per cent. or 2 per cent.—and then there should also be profit and some reserve fund for bad debts. I would suggest to the bankers that we should get sufficient money and can use the credit of the Government of India—not the guarantee but the credit. On certain conditions we can raise money cheaply and in the open market. There was a suggestion that we should get a capital of between 5 and 25 lákhs, as it is necessary, from private individuals; and on the security of the capital and on the security of the loans made by bankers the Government of India should allow us to raise debentures of the value of four times the amount of the paid-up capital. That means that the Government of India should give us a security in addition to the security of the shareholders' capital. In that way we can get 5 lákhs on shareholders' money and 20 lákhs on Government money. If we lend it at 7 per cent. we make about 2½ per cent. profit, pay for expenses and have some reserve for bad debts. The idea was to make loans through the Co-operative Credit Societies, and, where no societies exist, we should ask the agriculturists to join together and form Co-operative Credit Societies and receive loans from us; previous experience having shewn that there is not the slightest risk to banks to lend to the Co-operative Credit Societies. I have not known instances where the societies have failed to pay these loans. If we try to bring capital in touch with the agriculturists, then only can we help the agriculturists. At the last Conference we had unanimously passed a resolution that steps should be taken by which we can co-operate with Government to assist the agriculturists without taking any serious risk for shareholders.

Ráo Bahádur Ramchandra Swami Malapur, (Dhárwár) then observed as follows :—Mr. Chairman, Sardárs and gentlemen,—With regard to the question of capital for the convenience of agriculturists my opinion is that Agricultural Co-operative Banks should be started; if they are started, I am sure, money will be forthcoming without much difficulty. It should be recovered in the same manner as the *tagávi* is recovered by Government. I differ from the honourable gentleman who spoke before us, a few minutes before, when he said “we should have a different organization altogether and we should not have a summary procedure.” My experience is that the cultivator will remain honest if he is supplied with money by the Agricultural Co-operative Bank. If necessary, an amendment may be made in the Deccan Agriculturists' Relief Act, so that the cultivator may not have to pay *dámdupát* interest except in certain cases. Money-lenders will be pleased to lend money if they are

satisfied as to the mode of recovering their debts. At present their question is:—"How should we recover our money?" I, therefore, beg to suggest that this Conference do think seriously that this is a question of primary importance for the welfare of the agriculturists, and the only means I can suggest is that there should be Agricultural Co-operative Banks or an amendment of the Deccan Agriculturists' Relief Act, so that money can be lent to the agriculturists freely.

The Honourable Sir Vithaldas Thackersey said:—Mr. Chairman and gentlemen,—After the discussion on this question which took place here, you will allow me to move the following Resolution. Before I move it, I will say this that from the paper read by Mr. Brander you must have seen how successful the experiments on the Nira Canal are. Gentlemen, with your permission I will move

"That this Conference places on record its approbation of the help given by Government to the agriculturists on the Nira Canal, and earnestly hopes that, as these experiments have been so successful, private enterprise will come in to take up the work."

Mr. Chairman, with your permission I beg to propose this Resolution, and I am quite sure that the Conference will accept it. So far as the different schemes are concerned they may stand on their own footing; but so far as this one is concerned, we cannot but express our approbation of the good work done by the Government on the Chairman's (Sir John Muir Mackenzie's) initiation. We now find that a capital of about 2½ lakhs has been provided to sugarcane cultivators on the Nira Canal. It is a very successful experiment, as I expected it would be. Now our eyes are opened that, so far as this part of the business is concerned, it is absolutely a safe investment. Where large banks will not go in for this sort of work and take interest in agriculturists, I am quite prepared to render my services in forming small banks sufficient to enable us to help the Nira Canal agriculturists. I forgot to mention that, so far as the big scheme was concerned, it got the support of the Government, mainly through your (Sir John Muir Mackenzie's) interest in the subject. We got the support of the Government to this big scheme through your (Sir John's) personal discussion and deep interest in understanding the intricate details of the scheme whose feasibility and practicability were made apparent to Government. I am quite sure, Mr. Chairman, when this scheme or similar schemes are accepted by Government, and when the good work is being done in this Presidency, they will remember you always as one who helped in bringing the scheme to help the agriculturists financially.

The Chairman then read the resolution to the Conference and warmly commended it for adoption. In doing so he observed that great object to be pursued was the development of a scientific system for the distribution of capital to the agriculturists and more particularly to the solvent agriculturists. The savkars' system was unscientific. It resulted in heavy rates of interest having to be charged to solvent men in order to cover the risk of bad debts. The scheme dealt with in the resolution was one of several which were being developed with the intention of attracting, if possible, the capital of the large banks and merchants from the great towns in which it was concentrated to the rural tracts, and to demonstrate that there was a sound field for the investment of such capital in those tracts at moderate rates of interest.

[The Conference was adjourned till 12 o'clock on Saturday, the 2nd of October, 1909.]

3rd Day, Saturday, October 2nd, 1909.

Mr. G. F. Keatinge in the chair.

Gentlemen who wished to put before the Conference matters which had not already been discussed were invited to do so.

GRAIN BANKS.

Mr. S. G. Paregaonkar said :—Side by side with the Co-operative Credit Societies the institution of grain depôts conducted nearly on the same line and on the same principles can be of a very great service to the agricultural stock. Co-operative Credit Societies render substantial assistance to poverty-stricken agriculturists and do immense good to them by offering at a very low rate of interest money to be recovered by a process full of concessions, so that he may be able to break loose the fetters of the tyrannising baniás. This holy cause of redeeming the most important section of the society from the high-handed *sávkárs* can be much facilitated by establishing all over the country the institutions of grain stores. There is a time extending over at least a month or so preceding the monsoon of the year, when a large number of cultivators is driven in need of grain for their daily food and some of them have to go to the *sávkárs* for grain for seeding purposes during that part of the year when the sowing operations are carried on. At present the cultivator with great difficulty manages to procure the necessary supply from the bania or the *sávkár* who in generality of cases grants his request on condition of the loan being recovered in kind by taking twice the quantity which he has advanced. It is thus that the cultivator is thrown into debt increasing year by year to a quantity of grain which he is scarcely able to clear off and the pecuniary difficulty already experienced by him is doubled. It is a remarkable fact that almost the whole of the trade of the money-lenders is carried on during this part of the year. If the prices of grain after the next harvest are higher than what prevailed at the time of the advance the cultivators have to suffer a horrible loss. To remove this lamentable state of things the establishment of grain depôts, on lines suggested in the following, will, it is to be hoped, greatly improve the condition of the agriculturists, and may therefore be kept prominently in mind. These can be formed in every considerable village or a group of four or five small villages. What has to be done is that each cultivator is to be called upon to contribute a very small amount, say, one or two seers of grain per rupee of Government assessment paid by him. At the harvest time experience shews that a cultivator will contribute this without the smallest difficulty. The grain thus collected is to be stored in the village granary which will be under the control of the village *panch*. During the rains when agriculturists are in need of grain advances, and when the village bania is able to dictate his own terms, advances from this village granary will save the poor kunbis from falling into the clutches of the wily bania; but the greatest use of grain depôts is that they will act as an insurance against famine. In famine times the villagers are to be taken away for relief to distant places and the fact dislocates their families. These village granaries will on such occasions enable them to tide over the hard times and save them from the demoralising influences of habit to seek charity. They will not have to leave their houses and fields which in their absence must necessarily suffer. The village grain depôts could be expanded into Co-operative Cash Credit Societies without the least difficulty after a sufficient store has been laid in the depôt, sufficient to enable the village or group of villages to live for a season. The surplus may be sold and a nucleus for a Cash Credit Society formed. The formation and management of the grain depôts will give the villagers an education which will enable them to manage Cash Credit Societies. One great advantage in the grain depôts is that the villagers will not have to seek any assistance from Government, except occasional supervision by the revenue or civil authorities whose duty it will be to see that the accounts are properly kept and the grain in the depôts is not misappropriated. Nor need the Deccan Agriculturists' Relief Act, provisions about registrations and accounts, come in the way of recovering the dues from persons to whom advances are made from the depôts. Grain is to be advanced by persons who know the borrowers intimately. And it is not to be advanced except upon the security of a reliable surety. The names of the borrowers and the amount of grain advanced to them are to be entered in a book kept for the purpose. As it is in the interest of the borrower that the grain depôts of the village should prosper, there would be no difficulty in recovering the advances made. I can say from my personal experience that in course of time the villagers begin to take pride in the depôts as a thing

which should be kept up at all costs. In villages the rate of interest often is twice as much as the principal. If a bania advances a maund of grain to a kundi the latter has to pay 2 maunds in the course of about 4 months, that is, at the harvest time; and if the payment is not then made a bond is taken for the price of these two maunds as principal, and interest at about 24 per cent. per annum is charged on that amount. Under the rules of grain depôts increase is not to be taken at a higher rate than one-fourth of the amount advanced. That such an arrangement can be made without the intervention of the Government, will appear from the instances of three grain stores established in three villages in Sangamner Táluka, namely, Wadgaon, Rájápur and Nimon. Simple rules have been framed for the formation and management of these depôts and they have been found well in practice. If the Mámlatdárs are asked to state in their annual administrative reports how many grain depôts were formed in their tálukás during the year, that fact will itself be sufficient to induce the Mámlatdárs to take active measures in this connection. It may also be advisable to appoint voluntary organizers to form such depôts. It may be noted that grain depôts are particularly suited to comparatively poor districts like Ahmednagar where it is well known that agriculturists find it difficult to contribute even small amounts in cash. However well suited Cash Credit Societies may be to wealthy districts like Khándesh, Dhárwár or Ahmedabad in Gujarát, grain depôts are certainly more easy to form in poorer districts. As said above, in course of time these grain depôts can be easily converted into Cash Credit Societies. Similar depôts for supplying selected seed and fodder may also be formed.

Gentlemen, if you think a depôt will be more useful to the cultivators you will please express your views to that effect. On this point I beg to move the following Resolution :—

“That this Conference is of opinion that the institution of grain depôts should be encouraged by Government by asking revenue officers and organizers of Co-operative Credit Societies to take active interest in the establishment of grain stores and to note in their annual reports the progress made in this respect.”

Mr. Mollison :—How do you store different kinds of grain together?

Mr. Paregaonkar :—We take one kind of grain.

Mr. Mollison :—*Jowári*?

Mr. Paregaonkar :—We store *bájrí*. What I say is that *jowári* should be stored where it is consumed and *bájrí* should be stored where it is consumed. [In answer to further questions from Mr. Mollison :—] We should like to have arrangements for seed-supplies and food-supplies. I have found cultivators using seed for food. That is not done only in hard times; usually the cultivators want grain for food for two months preceding the monsoon. A grain bank is another form of a Co-operative Credit Society. Mr. Randive, the Mámlatdár, has already founded a granary under the Co-operative Credit Society.

Mr. R. R. Bhardi (of Poona) said :—Mr. Chairman and gentlemen,—I am of opinion that grain depôts need not be established. Their establishment is quite unnecessary. I don't at present see the importance of them. When I was in the Thána District some grain depôts were established in some tálukás. There the grain was not collected from all the cultivators free of any charge; it was bought for storing from the cultivators who were willing to sell it at the time of the harvest. Money was advanced, I suppose, by Government in buying the grain. Instead of giving money as a *tagávt* advance they gave the cultivator an order for corn. I don't know if those depôts are still there as I have not been in that district for years together.

Mr. V. B. Potnis, Mahátkari of Umbargaon (Thána) :—They are still there.

Mr. Bhardi :—If they are still there I think we may establish grain depôts on their lines instead of on the lines suggested by the last speaker Mr. Paregaonkar, because I doubt whether all the cultivators will come

forward and contribute grain willingly and gratuitously to these laudable objects. If they contribute gratuitously then no doubt it is a very good thing. I doubt whether they would contribute and whether, if they did contribute, the system would work for a long time. I suggest that the grain depôts should be established on the lines of those in the Thána District.

Mr. V. B. Potnis, Mahalkari of Umbargaon :—The grain depôts in the Thána District are started with money provided by subscriptions. We there buy common food-grain, *i. e.*, *bhát*, and give it to those who want it on *savdi*, that is, we take one-fourth more quantity back from the cultivator. This is taken at the end of December, January and February. This grain is converted into money again. This money is paid back as interest and as some part of the principal to the subscribers. Subscriptions are again collected about May—before the harvest season; then we buy grain again in January and give it to the cultivators who demand it. On this principle our grain depôts are flourishing.

The Chairman :—Is the management entirely with Government officers?

Mr. Potnis :—Yes, but the subscribers have some voice.

Mr. Jagdevrao Nimbalkar (of Phaltan) said :—Mr. Chairman and gentlemen,—Grain should be collected and supplied to cultivators. Grain depôts should be established and grain given on credit at moderate instalments, to the needy cultivators, like *tagávi*.

Mr. V. D. Puntambekar, Deputy Collector, Sátára, said :—Mr. Chairman, Sardárs and gentlemen,—A suggestion was brought forward here by a friend for starting grain depôts. It is an excellent suggestion; only it savours a little of the Márwári craft. It is proposed, according to the suggestion, to levy as interest one-fourth the quantity lent as principal. Now, one-fourth is 25 per cent., and 25 per cent. is not a small rate of interest. As suggested by another speaker, I say that grain should be bought and distributed to the needy cultivators at a very small rate of interest, say, 6 per cent. or 9 per cent. at the most. It has been shewn that cultivators of sugarcane pay the high rate of 9 per cent. because they are rich enough to afford to pay that rate. Nine per cent. is certainly a high rate of interest to pay. In the case of needy cultivators 6 per cent. interest should be levied for grain distributed to them from the depôts. To charge them 25 per cent. or a quarter more than the quantity advanced as principal is the Márwári way of calculation in a different form. In this way rich people are trying to wring out money from poor cultivators. The proposal is an offshoot of the Co-operative Credit Societies, but you must have a cheaper rate of interest so as to relieve the suffering poor.

Mr. D. R. Jani, Editor of *Khedut*, said :—Mr. Chairman and gentlemen,—The suggestion for a grain depôt is another form of a Co-operative Credit Society. I think the present Act gives scope for such an institution also. As far as the proposal is concerned, it contains the important idea of 'co-operate and support.' The last speaker rather unnecessarily discredited the scheme which has now been put forward. Twenty-five per cent. is not a high rate, considering the expenses for storing, deterioration in storage, loss through insects, etc. Then you have to look to the difference in prices of grain at the latter part of hot season and during harvest time. The loss caused by deterioration and other causes which I have just mentioned is not a small one, and, therefore, a large margin has to be kept for the rate of interest on grain delivered from the grain depôts. I don't quite understand the scheme of the *tálukás* in the Thána District. It seems to be another form of *tagávi*. I don't think it is to be encouraged, because there the money-lenders actually realise 25 per cent. at the time of the harvest on their capital.

Mr. B. V. Jádhav (of Kolhápúr) said :—Mr. Chairman, Sardárs and gentlemen,—I have great pleasure in supporting the Resolution laid before you by Mr. Paregaonkar. The Thána scheme for grain banks has also been laid before you. I think there are grave defects in the scheme now practised in Thána. In the first place, it is a purely charitable scheme in which some gentlemen come forward, raise money, buy grain and lend it to poor cultivators. At the time of the harvest the loan is recovered with interest and sold and the money

proceeds are refunded to the subscribers. After the donors get back their money business is stopped for the year. Fresh transaction is again opened when fresh demands are made by cultivators. Instead of such a scheme if there is a permanent fund the condition of the ryot will be permanently improved. The scheme put forward by Mr. Paregaonkar deserves our keen attention and I beg to support it. It is calculated to preserve the self-respect of the agriculturists.

Mr. G. F. Keatinge (Chairman) observed that apparently the principle on which grain banks were to be founded was the same as that of Co-operative Credit Societies, except that grain was to be banked instead of money; that it was a more difficult business to store grain than to store money, and required some special knowledge such as banias possess, and that he was doubtful how far Government could be responsible for the storage of grain on a large scale.

Mr. Paregaonkar said that no help was required from Government beyond supervision. The motion was then put to the meeting and carried.

A SPECIAL CESS FOR THE EDUCATION OF BACKWARD CLASSES.

Mr. Munchershaw Manekji, Kárbhári of Nargol, said:—Mr. Chairman and gentlemen,—I feel very grateful today in being allowed to address a few words on the subject that I have chosen in this Conference. There is a very limited time at my disposal, and so I shall very briefly lay before you the various matters, as far as I can, with a view to invite suggestions as to what should be done to improve the condition of the people whose cause I am today advocating and whose improvement, in my opinion, is essentially necessary in the advancement of agriculture in the Thána District, from where I have the honour to come. I have especially chosen the subject "The poor Wárlis Cultivator." In the first place, I must tell you that the word 'Wárlis' should include Wárlis, Dublás, Dhodis, Konknas, Káthodis and other aboriginal races who form the majority of the cultivators in the Thána District. If we study their history, about a quarter of a century ago, we find these Wárlis were owners and cultivators of their own lands, paying assessment to the Government, and we also find them happy and contented in their own way and in the full enjoyment of their independence. We also find amongst them a Pársi liquor shop-keeper or a bania selling salt and tobacco, or a Marátha sepoy supposed to have very good influence with the officials at the táluka, or a Bráhma who then seems satisfied with what little he earns as a Taláti; whereas, looking to the present state of affairs, we find that the Pársi, the bania, the Marátha and the Bráhma have gradually become owners of the lands belonging to these original petty land-owners, taking advantage of their utter ignorance and helplessness, by means which, at times, were most unfair and dishonest. I am really tempted at this time to give you a short account of the means utilized for the purpose of acquiring the lands of these illiterate Wárlis, but I cannot do so, because, in the first place, it would be out of place, and secondly, because I cannot, with all my efforts, give a detailed account in such a short space of time at my disposal. Suffice it to say for the present that, if force and compulsion did not prevail with the Wárlis to induce him to part with his ownership of the land, perjury, forgery and criminal prosecution, at times, were used as more effective measures for the purpose of compelling him to part with his property. I may be pardoned for this bold assertion on my part, but I may say with great confidence that not less than 50 per cent. of the transfers of land from Wárlis to higher castes in the northern tálukas of Thána are the results of forgery, fraud and chicanery, and that instances of that kind would be forthcoming if one only cared to study minutely and carefully the change of ownership of these lands. Of course, I do not mean by this to make a general assertion against all land-owners, but I speak of cases which, in a short time, have come under my notice and observation. However, I must leave this point for the present and come to my original subject. You must remember that I am only dealing with the history of the district from where I have come, and more particularly of the táluka where I am myself a land-owner. I do not profess at all to speak about other districts. To me it is clear that the original land-owners have today become

our tenants-at-will for no fault of theirs. We have to depend upon them entirely for the cultivation of our lands and the advancement of our welfare, and still, if we look to the consideration that is shewn to these people by us, we cannot but say that as human beings we have miserably failed to do anything to alleviate the wretched condition of these distressed people. For every inch of ground to be cultivated we have to depend on their labour, and for every pice that we accumulate we are thankful to them; yet, the land we possess today originally belonged to them, and still, with all this, this backward class has always been neglected, forgotten and in a way despised by us. If we are to make any improvement in the agricultural condition generally, I am firmly of opinion that, unless and until we improve their state and condition, we can never hope to achieve our object. At present a poor Wārli can hardly think for himself, can hardly even realize his position, and is nothing more than a man without intellect and understanding, day after day doing his work in the same old orthodox and mechanical fashion with very little advantage to himself and to his *sāvkar*. How are we then to solve this problem? I should seriously suggest to our benign Government that primary education, at any cost, must be introduced amongst these backward classes. No doubt, an attempt is being made in a few places, but there are only two schools at Udwa and Uplat at present in nearly 200 villages in, what is known as, the *jungle-patti* of Māhim, Dāhānu and Umbargaon. I should think this attempt is next to nothing. In my opinion, if anybody should take a forward move in this direction, it is the land-holder himself, and by so doing he would not only benefit his poor, illiterate tenant, but he would also himself derive a great benefit thereby. Give this Wārli some primary education, so as to enable him to think for himself, to reason and to judge for himself, and I dare say the result will be highly satisfactory. It is rather a difficult task and will take time to be accomplished, but when once we make a move in this direction with heart and soul, with the kind co-operation of our benign Government, I am sure we can very easily achieve our object; and once we do this, our attempt to improve the agricultural condition will be more successful. For this reason, I would propose that the Government should levy a special one-anna cess for every rupee of assessment for education alone in the Thāna District, as an experiment.

The Chairman :—Your proposition is that the District Local Boards should raise a special extra rate of one anna in the rupee?

Mr. Karbhari :—Yes, for education alone.

The Chairman then placed Mr. Karbhari's proposition before the Conference.

The Honourable the Chief of Ichhalkaranji :—Government have in contemplation a measure by which they want to empower the Local Boards to raise the assessment by one anna in the rupee to be spent on primary education.

Mr. Paregaonkar :—We have also received a copy. There is no necessity for passing any Resolution on the subject.

The Honourable the Chief of Ichhalkaranji :—The Resolution may be passed all the same.

Mr. Karbhari :—I understand the District Boards are not in favour of the proposition. I, therefore, propose that this subject should be taken up by the Conference.

The Chairman :—Gentlemen,—The question is whether this Conference approve of Mr. Karbhari's proposal that the Local Boards should be asked in this district in the interest of the backward classes to collect one anna in the rupee as assessment to provide for the primary education of the backward classes.

Mr. Bidikar :—I am not in favour of the proposal.

Mr. Paregaonkar :—This is a question of landlords. If one anna is to be levied, it would be levied on these very backward classes. Several gentlemen having spoken against the proposition,

Ráo Bahádur Ramchandra Swami Malapur said:—I think that instead of passing this Resolution offhand at present we should allow the question to engage the attention of all of us. I think this Conference should wait till the question is settled by the District Local Boards and till they have submitted their reports.

This view appeared to commend itself to the meeting, and the proposal was then dropped.

SUBSIDIARY INDUSTRIES.

Mr. B. V. Jadhav (of Kolhápur) said:—Mr. Chairman and gentlemen,—The deplorably poor condition of the ryots is engaging the attention of Government and the public, as is evidenced by the large attendance of earnest men at this Conference. Improved methods in agriculture will do much, but it is a question of time, and requires some economical help, that is, capital. Some big industry requiring very little capital and labour is, therefore, largely necessary. This has been engaging the attention of His Highness the Chhatrapati Mahárája of Kolhápur, and the more so since his return from England. He has introduced tea, coffee, cardamom, and aloe plantations. But these are not big industries, and the attention of His Highness was also drawn to the following:—he has tried bee-hiving, sericulture, cattle-breeding, and poultry-farming. His Highness's efforts in bee-keeping did not meet with success, as the imported bees died before they were acclimatised for want of expert supervision. His attempts in the other industries have been successful, especially in that of cattle-breeding and poultry-farming. Five hundred cows were brought from the Bombay Pinjrapole and distributed among the cultivators of the Krishna Valley, on condition that they were not to sell the animals. A fine breed of bullocks has now been raised. The various cow-protection associations might follow this example and assist the agriculturists by providing them with cows for breeding. Milch-cattle are also a very paying concern to the cultivator, as the straw he gets along with grain is utilized as fodder. As to keeping poultry, Marátha cultivators about Kolhápur have found out that that is a paying concern. By keeping only half a dozen fowls a man can make about 4 annas a week, and that adds materially to his well-being. I, therefore, call upon the gentlemen here to assist the poor cultivators by advising them and assisting them whenever necessary to keep a cow and fowls. Gentlemen, in cattle-breeding something should be done. I crave your indulgence to speak a few words to induce you to exert yourselves in this respect. I do not call upon Government to do anything in the matter, because they are doing their best already. It is proper on the part of those that are interested in the welfare of the agriculturists to assist them in this particular respect. Cattle are useful for two purposes, *viz.*, for ploughing and for giving milk. We want both plough-cattle and milch-cattle. Both these are profitable industries in these days. As I have already said, His Highness the Chhatrapati Mahárája of Kolhápur brought 500 cows from the Bombay Pinjrapole after the famine of 1899 and the breed from them is excellent. The cow-protection question raged furiously 10 or 20 years ago. Now, I would ask charitably-disposed people to buy cows and hand them over to the agriculturists on the understanding that they should not part with them at all. With the help of the plough-cattle the agriculturists will raise fodder which will go to feed the cows and calves. They can also maintain poultry farms on their grounds, because that is another sort of profitable industry. If a man keeps some hens he need not withdraw his capital or labour from his agricultural pursuits. By means of these industries the condition of the agriculturists will be improved to a marked degree.

Mr. A. M. Bidikar (Belgaum) said:—Mr. Chairman and gentlemen,—It is found that agriculture alone does not pay sufficiently to a person of means who would like to enter into it for a profession. Such being the case, should this profession be avoided by them or can means be found to make it tolerably well-paying? Having some experience in rice-producing tracts, the remarks that follow are applicable mainly to those parts, though some of them may also be applicable to the other portions of this Presidency. A man with a pair of bullocks cannot cultivate more than 5 acres of rice-land and the

income from this piece at the present time is such that in good years the profits are barely sufficient to maintain him and his family for half a year after paying the expenses of cultivation and the land assessment. The farmer therefore has to take recourse to some other business in addition to the cultivation of land, and he therefore engages his bullocks and carts for hire to carting firewood or other things from the jungle to railway stations or to towns or engages on road-making, etc. The effect of such work with very little grazing causes deterioration among the cattle and the mortality among these is great. The agriculturists return generally to work in their fields in May with their weak bullocks, and the cause of cultivation suffers. This being the case it is necessary to see if any other means can be found to make the cultivators get sufficient livelihood. The remedies that I propose are applicable in cases where water—surface or sub-soil—is available for irrigation. I believe some of these means may also be available on lands where such water is not available in monsoon and some time after it.

1. In lands where sub-soil or surface water is available for irrigation a portion of land about 2 acres may be used for growing garden crops, such as sugarcane, potatoes, turmeric, etc.

2. About half an acre should be used for growing fodder or grass for cattle. I would prefer Guinea grass for such purpose. This grass gives a large yield and several cuttings and remains green throughout the year, stands draught for considerable time and grows even in shade. A mango tope or other such place can be utilized for this purpose. It would be seen that this portion of land can be used for a two-fold purpose—of growing fruit-trees and grass together.

3. About half a dozen milch-cattle, besides those for plough, can be bred on this farm, which, besides supplying milk to the farmer and some manure to the field, would enable him to have plough-cattle for his farm and a pair of bullocks for sale. This would give him an income of about 60 rupees a year.

4. He can have half an acre of land or can use his backyard for growing mulberry trees which would enable him to rear some silk-worms and thus gain a good income from it. From inquiries that I have made and from what I have read I have learnt that places where the thermometer does not rise over 90 or go below 60 in shade is a fit place for sericulture and such places can be found in and near about Belgaum. I have come to know from old persons that silk-worms were reared in Belgaum some 70 years ago and many mulberry trees were seen by me in the backyards of several houses. Now a trace here and there of these trees can also be seen here. No causes why this industry was discontinued here can be known. I have seen about 4 years ago some silk-worms were reared by a man and he used to collect mulberry leaves from trees in the backyard of several persons. It is plain at all events that the climate of Belgaum and places on the gháts to the west and south of Belgaum is suited for sericulture. I learn that Mr. Bose had come here and gave his opinion that this place is well suited for this industry which is as yet neglected. It is considered as a home industry and not fit for capitalists to enter into. I do not understand why it should be neglected because it is not suited to the millionaires or Joint Stock Companies. There is the more reason because it is a home industry that experiments should be made to make it popular as village industry or as a co-ordinate industry on small farms for persons of moderate or small means. This would certainly give a good profitable business to the cultivator in the leisure time when he cannot or does not work on his farm or he can pick up a few moments from his work and can use his young children and old women, who can be of very little use for his farm work, to pick leaves for the worms. With an acre of mulberry a person can make a profit of Rs. 200 a year. This is a good sum for a farmer of small means and even for one of tolerably good means. (In the Agricultural Journal of India for January 1909 Mr. Mollison, the Inspector-General of Agriculture, has in his paper shewn how this industry is made a village industry by the distinguished Mr. J. N. Tata at Bangalore and the surrounding places.)

5. Castor can be grown in many places in this Presidency. I suppose it is grown in all places above the gháts and eri-worms can also be reared in addition to the silk-worms. These are said to be more robust and can stand higher temperature and greater changes in the atmosphere than the silk-worms.

6. If reeling of silk be resorted to on the farm another industry of poultry breeding can also be taken in hand. The silk-worms and moths that are killed or die, with some grain, will serve as food for these. The droppings of poultry form good manure for mulberry trees. I have found from experience of 15 years that if poultry is bred in open place apart from villages or towns they are generally free from diseases, and I know that more than 50 were bred from one hen during the course of a year without the help of incubators or foster-mothers. If these means of breeding were resorted to I do not know to what number they would have grown. From what I have read in papers and from diagrams drawn in books on these matters I think that reeling from cocoons can be learnt by a man of ordinary intelligence in about three months (*vide* Mr. Mollison's paper above alluded to) and all the industries that I have mentioned above are possible. I pray Government to try a farm on these lines. If it thinks such a farm too costly I would suggest that attempts be made if any private individual would with Government aid start such a farm.

The Chairman (Mr. Keatinge) said:—As regards silk, I may say that Mr. Lefroy's advice is as follows: so far as the Bombay Presidency is concerned mulberry trees can undoubtedly be grown in many places, but in order to produce a luxuriant growth it is necessary to have a good soil and irrigation; and that, although in this Presidency good soil and irrigation is to be found, it would probably be more profitable to grow other crops than mulberry. That being his view he does not at present recommend people to attempt in this Presidency to grow mulberry silk. On the other hand, eri-silk is likely to prove a more profitable investment wherever castor leaves, which are necessary for worms to feed on, can be obtained for nothing. Among the leaflets you will find a leaflet prepared by Mr. Lefroy himself dealing with this subject. The leaflet has already been distributed, and is available in considerable numbers in English; it will shortly be translated into vernaculars and then will be freely distributed.

Mr. M. Sitole, Director of Agriculture, Baroda, explained what steps the Baroda State was taking to encourage ericulture, and in answer to Mr. Bidikar said:—To produce one pound of cocoons it requires two maunds of green leaves, and one acre will produce from 150 to 200 maunds of green leaves. One pound contains about 1,800 to 2,000 cocoons. He added the Baroda Government was willing to help those who took up this eri-silk business.

Mr. J. W. Mollison, Inspector-General of Agriculture in India, said:—Mr. Chairman and gentlemen,—Reference was made to poultry breeding. I personally introduced it at Pusa; I had a pure breed of English poultry, turkeys, geese and ducks. I don't believe that many of these pure breeds will be in themselves suitable for Indian conditions. But I am quite sure if you cross breed they will be suitable for Indian conditions. Cross breeds suitable for Indian conditions should be built up. If any one wants to be helped in this direction, I would supply him with a cock and two hens from Pusa.

WORK BY AGRICULTURAL ASSOCIATIONS.

Mr. V. S. Mutalik, Honorary Secretary, Bijápur Agricultural Association, produced specimens of potatoes, groundnuts and chillies from Bijápur and said:—Mr. Chairman and gentlemen,—I wish to say a few words on the principle of co-operation; even if it is carried on on a small scale it will lead to results which are of great value in trifling matters too. We work on the principle that example is better than precept. I wish to bring to your notice a few concrete instances in connection with the Agricultural Association of Bijápur. Before July last year the agricultural interest in our district was not so keen as it now is. The existence of the Agricultural Department was then unknown to the

majority of our people including landlords, although some educated people used to read about it occasionally in the press. Gentlemen, potatoes were never before grown in our district. They were sown there in June last under the advice of the Agricultural Department, and their specimens are now placed on the table in front of the Chairman for your inspection. We had received some millet and Kumpta cotton seeds from the Department which were distributed and sown, and we await with interest the results of the operation. The best variety of rice which is grown in the southern parts of the Bijápur District has also been distributed. It was dressed with copper sulphate under the advice of the Divisional Inspector of Agriculture. Our Association has got a library where it keeps the leaflets and bulletins received from the Agricultural Department. Our experience is that most useful work can be done by our united efforts than by one's individual attempts. United we can work with more energy and enthusiasm. Our Association will always require the assistance of the Agricultural Department and the sympathy of the Collector of our district. We already have it profusely. We are in great need to learn of the best pump or the best water-lift that could be used for irrigation purposes. In some places in our district the water-level can be reached below 10 to 20 feet while in other places it can be reached below 20 to 30 feet. On the other hand, in our district there are certain rivers and wells which can be properly utilized if we get a correct idea on the subject. We want the best means that could be used for lifting water for irrigation, and I hope you will be good enough to speak to us with some experience and authority on the subject on any subsequent occasion on which we may be able to meet together. With these words, gentlemen, I leave the potatoes and chillies here to be judged by you.

Mr. L. K. Kirloskar (Belgaum) said :—Mr. Chairman and gentlemen,—I would like to say as a member of Messrs. Kirloskar Brothers, that in order to introduce our Improved Agricultural Implements, we are prepared to supply all our implements to all the Agricultural Associations and to all the Government Farms at a reduced rate of 10 per cent. off our regular retail prices for cash against order. I think when the Associations buy the implements from us they will be able to sell them to the cultivators at a cheaper price, and, if possible, they can give the poor cultivators the use of these implements on a small reasonable rent. Secondly, the cultivator will be able to see the implements before he makes a purchase of them, and lastly, it will be a direct help to our local industry in manufacturing them on a larger scale.

DAMAGE BY WILD PIGS.

Mr. G. N. Ghotawadeker, Editor, *Shetkari*, said :—Honourable President, Maharájáhs and gentlemen,—The question that I wish to place before the Conference is regarding wild pigs and wild beasts, etc., that cause a great deal of loss and trouble to the agriculturists. During the last 30 years I have been urging in my articles on agriculture in the *Shetkari* that early steps should be taken for the destruction of wild animals.

Only just a year ago I again introduced the subject in my pamphlet under the heading "Will Government and the Director of Agriculture pay attention to this subject?" but I am sorry that no steps appear to have been taken as yet in this direction, perhaps owing to pressure of other work. I personally showed to Messrs. Keatinge and Anderson and Dr. Mann when they had come to see my farm at Ghotawada the havoc done by wild pigs. Sugar-cane, groundnut, shalu, jowar, nagli, gram, rice and root crops are the favourite crops of the wild pigs. I have personal experience that lands near forest boundaries are mostly lying waste, owing to the trouble of wild animals. This has caused a heavy loss to several farmers and compelled them even to mortgage their lands for paying Government assessment. The ryots' losses are not only in crops but also in cattle and men.

I don't wish to take valuable time of the Conference by dealing at length with the subject except suggesting a few remedies :—

- (1) To offer more substantial rewards for their destruction than at present.

(2) A more liberal issue of licenses to the agriculturists especially in villages adjoining the reserved forests.

(3) Free grants of loans of money wherewith to buy firearms and ammunition for the purpose.

(4) In the forests generally wild pigs take shelter. In order that they should not take shelter in forest I would like to propose to the Conference to request Government to remove shrubs like *Lāuntanā* (Tantani), etc. These shrubs not only shelter wild pigs but also shelter troublesome flies, which cause much trouble to the cattle grazing therein. Besides this the shrubs smother useful grasses under their shade and deprive cattle of their useful grazing. I am aware of the advantages of shrubbery from the forest point of view still I cannot help urging on the removal of the shrubs in the interests of the agriculturists. Lastly I wish to propose to the Conference to request Government to take with the least delay steps in this direction. The matter is of such a serious and urgent importance, hence I would suggest that the Conference would press for early consideration.

The Honourable the Chief of Ichalkaranji said :—Mr. Chairman and gentlemen,—I can tell you how these pigs are destroyed in some places. People know exactly the routes by which the pigs come and they make long ditches. In these ditches the animals fall and they cannot get out as they are very fat, and the next morning a hearty meal is made of them by villagers.

Mr. A. M. Bidikar (Belgaum) :—Mr. Chairman and gentlemen,—I want to refer to the Forest Department in this connection. Perhaps you will think that I am always passing remarks against that Department. I would suggest that licenses should be given for the use of guns to cultivators in the reserved forests. If arms are distributed in my part of the country and if licenses are given freely permitting the cultivators to enter jungles with guns, a large number of pigs can be destroyed.

FRUIT CULTURE AND IMPROVED IMPLEMENTS.

Mr. Puntambekar (Sátara) advocated an extension of fruit growing, and in particular of grape growing, giving figures showing what profits were made from vineyards in other countries; and requested the Agricultural Department to take the matter up. *Mr. W. Burns*, Economic Botanist, explained that the Department was making investigations and experiments in the matter; and agreed that there was an opening here for much improvement.

The Honourable Ráo Bahádur Sardár Kupuswami Mudliar (Poona) then gave an account of various agricultural experiments that he had tried, and described the advantages of using a pump driven by an oil-engine.

THE NEED FOR AN AGRICULTURAL JOURNAL.

Mr. Adarji Muncherji Dalal of Broach said :—Mr. Chairman and gentlemen,—I wish to move that this Conference resolve to draw the attention of the Agricultural Department to the advisability of publishing an agricultural journal to be edited by expert officers of the Department in English first and then translated into principal vernaculars of the Presidency. The journal should be issued at a very moderate cost and at special concession to those agriculturists and land-holders that pay to Government a certain amount of land revenue. That is the proposition that I would recommend for your acceptance. I do not think it will require any speech *in extenso* on my part to support this Resolution. Its importance is self-evident. The Department is issuing leaflets broadcast. If the Department were to issue a monthly or bi-monthly journal, its contents would permeate to the masses through the vernacular press.

Mr. Anupram Kérparam of Surat and the Hon'ble *Ráo Bahádur S. K. Rodda* supported the proposal.

Dr. H. H. Mann, Principal, Agricultural College, said :—Mr. Chairman and gentlemen,—Speaking on behalf of the Agricultural Department I may say that I have the fullest sympathy with the Resolution which is now placed before the Conference. The publication of agricultural information both in English and in the vernaculars in the form of a journal is probably far better than the publication of leaflets as is done at present. But there are certain difficulties in the way. I must, in the first place, tell you exactly what the Department is doing in the way of publication. At present we have a series of leaflets written in the simplest possible language spoken by the agriculturists in the Presidency. Although I say a journal might have been better than most of the leaflets, the leaflets have this advantage, that they can be distributed in enormous quantities and that they can penetrate into places where the journal may not go. We can supply leaflets broadcast wherever we think they will prove beneficial. We are also issuing a series of more technical bulletins which are very valuable. The two or three issues recently out were of extreme value; the last one was written by Professor Kelkar on “night-soil.” It is an extremely valuable book. I say the whole series will be found to be extremely valuable to those who can read it and to those who can understand the subject. Then we have the Agricultural College Magazine, which is entirely edited by the present students of the College and Graduates. It is entirely of a professional character. We have had some recent investigations or some actual work done by some gentlemen in connection with agriculture. To them the Agricultural College Magazine would be of considerable importance both from practical and theoretical points of view. For this year it is six-monthly; in future it will be quarterly, the price remaining the same, *viz.* Rs. 2 per year. I fully recognize, and I think the Department fully recognizes, that something more than this is needed. I think the agricultural journal should be monthly or possibly quarterly, in the first instance. As to the agency through which the journal should be published, I am not sure that the Deccan Agricultural Association would not be the best; a journal conducted by that Association will carry more weight than if it is done directly by the Department. Any criticism in agricultural matters, which can be published in the journal, would be of considerable value. If such a journal was issued by the Deccan Agricultural Association it would have full sympathy and full support of every body—every officer of the Department and others. I may say that the Department will be willing to direct and give every assistance. I feel the idea of having a journal is excellent, and if the necessity of a journal is not felt at the present moment, I am sure it will be rapidly felt. I fully recognize that the Associations of Káthiáwár and other Gujaráthi speaking districts will support the journal, thereby first hand information on all important agricultural subjects can be speedily collected and published in the journal.

Mr. D. R. Janni, Editor of the *Khedut*, said :—Mr. Chairman and gentlemen,—As proprietor of an agricultural journal in this Presidency, I would just call the attention of this Conference to the fact that already there are two such journals published in this Presidency—one issued by Mr. Ghotawdekar in Poona and the other by myself at Bhávnagar. Mine has been in existence for the last 5 years and Mr. Ghotawdekar’s for more than 20 years. Now, I can say from personal experience that the great difficulty in my way is to continue the journal unless I have the fullest sympathy from the general public. The general public should subscribe for the journal. The leaflets issued by the Agricultural Department contain mostly important information. I don’t think it would be better to multiply the journals at present. In our journals we can comment on the difficulties of the agriculturists and on the drawbacks of the Agricultural Department. The journal conducted by the Department cannot comment on its own drawbacks. Moreover it would be too scientifically conducted. I said we have already got 2 journals of this kind—one in Marathi and the other in Gujaráthi; I say there is also a third journal in the Kanarese language. So that in the Presidency there are three journals on agriculture in three different dialects; they require the co-operation of the public to make them a success. They require to be better and more regularly conducted. For the present we cannot do better; we have to do everything ourselves; we have no funds at our disposal. I ask for the public encouragement both on my own behalf and on behalf of Mr. Ghotawdekar in order to make our journals success-

ful in agricultural matters. I have already had much sympathy from the Agricultural Department. It has promised to give me all the diagrams at a reduced cost. I say 2,000 copies of my journal must be subscribed for before I can make it illustrated. I ask the Conference to recommend the public to give the fullest support to the existing pamphlets. These journals, which are conducted by individual persons, are better than those that would be conducted by the Agricultural Associations.

Dr. H. H. Mann said:—Mr. Chairman and gentlemen,—When I said with regard to the agricultural journal I forgot to make mention of the efforts made by Messrs. Ghotawdekar and Jani. Their efforts are extremely admirable. I should think the public have not appreciated their efforts at their proper value. I hope their journals will become more popular and that full support of the public will be given to them. On behalf of the Agricultural Department I say that they will receive our support. They are working well in their own spheres, and I hope any changes that may be made or anything that may be started will not be started without consulting these gentlemen.

Mr. Dalal's motion was then put to the meeting, *viz.*, "That the Agricultural Department should be requested to publish a journal containing matters which might be useful to the agriculturists of the Presidency" and was carried.

Mr. K. R. Godbole said:—Mr. Chairman and gentlemen,—I want to address you a few words about the Agricultural Conference to be held next year. I want to make the following proposal with reference to the next year's Conference. I propose that the next year's Conference be held in this city of Poona. I don't say that because I am a resident of Poona, but because we have special facilities here in the matter of agriculture. First, we have the Agricultural College and then we have the Demonstration Farms in connection with that institution. Then we have the botanical experts here, whose labours we have just seen. All these facilities make it expedient that the next Conference should take place here. That is the first part of my proposition. The second part of the resolution refers to the economising of time. We have been able to go, during the last 3 days, through a number of varied subjects. Unfortunately, the speakers have tried to tread upon each other's toes. The same subjects were covered by many papers. That has caused a great waste of time. If the over-lapping of subjects had been avoided, the time which was wasted would have been more usefully employed. I, therefore, beg to recommend that in the case of next year's Conference we should arrange matters in such a way that there should be no similar waste of time. I recommend that the authorities should arrange that one month before the Conference proposals should be sent in to the organizers of the Conference. The authorities should then collate all the papers that cover the same ground and embody them in one proposal. Such proposals should be circulated to all the gentlemen that propose to attend the Conference. These gentlemen should study the proposals and on them make short speeches instead of writing big and lengthy reports. The second suggestion is that we should have non-official Secretaries to work along with the Director of Agriculture. For instance, we should induce the Honourable the Chief of Ichalkaranji to act as the first non-official co-Secretary. The third suggestion is as regards the formation of the Conference. I think time will come when we shall have to introduce the elective principle. At present invitations are sent; under that system gentlemen came here and we have had very valuable discussion at their hands for the last three days, but I think if it is not possible next year, in the succeeding year we must do something in the way of giving certain shape to the Conference. We must give it certain constitution. For that purpose we shall have to form Táluka Associations in every district, each district being divided into 8 or 10 tálukas. Each one of these tálukas should have an Agricultural Association for itself which should form a Táluka Association. Each Táluka Association should send 2 or 3 or any definite number of members to the Conference to represent the táluka's interests. This is the form the Conference will have eventually to adopt. Perhaps, it may not be possible next year, but the year after the next.

Mr. S. S. Deshpande, Mámíatdár of Mahád, said:—Mr. Chairman and gentlemen,—My suggestion is simple and will be expressed in a few words. In order that the exertions of the Agricultural Department and its researches may be of practical benefit to agriculturists and to the improvement of agriculture, in general, it seems to me that for each táluka or for a group of more than one tálukas, till a sufficient staff is available, a Graduate of the Agricultural College should be appointed as Circle Inspector called, say, Circle Inspector of Agriculture, whose duties should be confined to matters connected with agriculture only. The Mámíatdár should not tell him to collect land revenue, tagái, measurement expenses or other Government dues, or to measure lands or settle boundary disputes or inspect boundary marks or prepare the annual statistics or any other matter which is not immediately connected with agriculture. The present Circle Inspectors, to which posts of late some Licentiate of Agriculture are appointed, do their duties and have hardly any time left, in their multifarious works, to further advance the scientific knowledge of agriculture, which they have gained in their College course, and they are apt to forget a good deal of it in course of time. All the above duties should be performed by the Circle Inspectors who have undergone the survey course in Belgaum, Poona and other centres. The Licentiate of Agriculture, appointed as Circle Inspector of Agriculture, should tour in the táluka, examine the nature of the soil from place to place, explain to the ryots what manure is suitable for their lands, and how to prepare it and what sort of seed they should use and where they should get it, procuring the same for them whenever he can. He should also make experiments wherever he finds it suitable and necessary. He should also study the Agricultural Bulletins, issued from time to time, and other magazines, dealing with agriculture, and bring into practice any useful information contained in them. In fact, he would be a valuable adviser on the spot in matters of agriculture to the ryots of the táluka, who will repair to him not only for instructions about ploughing and sowing but also for advice whenever they find their crops affected by any disease. Cultivators attending Conferences and Meetings of Agricultural Associations are quite liable to forget, as soon as they go away, what they have seen or heard there. But the free advice of a Circle Inspector of Agriculture, available on the spot and at the proper time, will be a real boon to them all and in the long run will be very beneficial to the State. This Circle Inspector will be of immense use to the Mámíatdár also. He will tell him whenever his advice is sought for, what seed should be supplied to a particular applicant by way of tagái and how much or what advice will suffice for purchasing the seed, or money for the improvement of the land. He will also assist the Mámíatdár in making the anna valuation of crops, on which, according to the present orders of Government, the collections, suspensions and remissions are based. The appointment of such a Circle Inspector may not cause any additional cost to Government. At present, there are 4 or 5 Circle Inspectors in a táluka. One of them may be replaced by the Circle Inspector of Agriculture. It will be said that the duties of the present Circle Inspectors are so numerous and are so increasing day by day that none of them can be dispensed with, but I think that a good deal of their work can be performed by the ordinary establishment of the Mámíatdárs and by the appointment of temporary measurers at the cost of the applicants. But even if the appointment of Circle Inspectors of Agriculture would throw an additional cost on the State, it would be found, in course of time, to be much less compared with the advantages gained, as lands will be more productive, ryots will be more contented and they will pay their assessment more easily. Then there will be less excuse of a poor yield for which, at present, to a great extent, their own ignorance and negligence are responsible and there will be a general economical improvement of the country. I would conclude with a proposal:—

“That in the opinion of this Conference, one or more Licentiate of Agriculture should be appointed to each táluka or to a group of more than one tálukas, till the sufficient staff is available, in lieu of one or more of the ordinary Circle Inspectors or in addition to them, to advise the cultivators in matters of agriculture, and also to advise Government officers in matters connected with the same.”

The Hon'ble Sir John Muir Mackenzie now resumed the chair and closed the Conference with the following speech :—

Gentlemen,—I observe that the correspondent of the 'Times of India,' who has been following our proceedings and reporting them with much intelligence, has called this a 'consolation day,' that is to say, a day on which we can say all that remains in our minds to say without fear of having a watch brandished in our faces by the President. It is to show how deeply I sympathise with all those that could not say what they wanted to say that I have come here now for the purpose of inflicting a speech on you. Now, first of all, I should like to refer again to the size of this gathering, which is a matter of great congratulation, showing what intense interest in questions of agriculture and in the work of this Department has been exciting throughout the Presidency at large. I think perhaps that apart from the work of the Department, one reason and the deeper reason for this great interest, is that the people see there is no Government money in this business, that the Government are not doing this with the object of raising assessment or of screwing money out of the ryot. In case, however, there should be the slightest misapprehension on the point, I want you to carry it home with you that whatever improvements may be effected whether in the quality or value of the produce of land, as the result of the efforts of the Department of Agriculture, or as the result of your own efforts, there is not the least danger that they will cause an increase of a single pie in the assessment. (Loud cheers.)

This matter is one on which there exists an extraordinary amount of misapprehension. It is, I believe, the firm conviction of many people that Government have been taxing improvements at every revision of settlement. I assure you that such has not been the case. On the contrary the greatest pains have been taken to avoid taxing improvements in accordance with the law and the often declared policy of Government on the subject. The matter was obscured at the first revisions of settlement because such revisions with scarcely an exception resulted in general enhancements. If however the principle on which the enhancements were made is carefully examined the truth of what I have just said, *viz.*, that Government carefully refrained from taxing improvements, will be made manifest. Anyhow the more recent revisions—usually second revisions—will make the matter absolutely clear since in many cases no enhancement has been taken at all, and where enhancement has been taken the ratio of enhancement has been exactly the same in all lands of the same class whether they have been improved or not. For instance in lands with wells made during the currency of the settlement under revision no greater enhancement has been taken than on lands which have no wells. This will show you that the *Sircar* is absolutely 'pacca' in its assurance that no improvements made by the ryot will ever be taxed, and I want you plainly to understand that this assurance applies to improvements of every class whether they be wells or bandhāras or other works or whether they consist of more valuable or more abundant crops due to improvements in cultivation, the application of manure or any other measures of improvement which you may adopt either on your own initiative or the advice of the Agricultural Department. (Cheers.)

In the next place I should like to say that of even more value than the discussions which have taken place in this hall have been, in my opinion, the demonstrations which have been given at the College and other farms. I am sure that many of you have been able to pick up very valuable information. At the same time there must have been many who were unable to see things well, and for their benefit I have to announce that College will remain open for the next week to any person who likes to go there and examine the farm and other things which are on show. After the completion of the College there will be kept a large hall expressly for the use of visitors who will find there all sorts of information, such as Departmental Bulletins and other library publications, museum specimens, pictorial illustrations, and so forth, information regarding which will be supplied by the Curator, the Librarian, and other officials of the College.

The procedure of our Conference, I fully agree with R. B. Godbole, is susceptible of improvement. The exact line of reform is not easy to settle, but the matter will be fully considered before the next Conference. I should like here

once again to thank the 'Times of India' for their excellent report of our proceedings. It would be quite worth while in my opinion to have that report translated and circulated to the vernacular papers which I hope will find room for it.

Now, gentlemen, I turn for a moment to the subject of the associations. In my opinion the ideal for every association, that may be established, is that it should have its own plots or its own little farm. It will, I fear, be generally necessary for every association to raise money to buy or rent plots for itself. From such associations we should expect to receive information upon the particular problems which interest them most. We should also expect the members of the associations to come to head-quarters, to the experimental farms or to the College, to make enquiries and learn something, to carry it away and to execute on their own plots. I would also earnestly suggest to the already existing associations, of which 10 new ones were established during this year, that they would do well to affiliate themselves to our Central Deccan Agricultural Association. That association being a numerous body and having plenty of members on its list, will be to a great extent in immediate touch with the head-quarters and supply information rapidly and satisfactorily.

Turning now to the suggestions brought forward by Mr. Bidikar for the establishment of oil factories, I need scarcely remark that nothing would give greater satisfaction to Government than to see such factories established. I fully believe there are localities in which they could be started with every prospect of success. One of the first results of their establishment would, I hope, be that better prices would be given to the growers of foreign species of groundnut. I am happy to say that the growth of these species is spreading steadily and rapidly. They are popular because they yield a heavier outturn than the indigenous variety. What perhaps is less well known is that the foreign varieties of groundnut contain a larger quantity of oil than the indigenous, and that on that account a better price ought to be obtained for them weight for weight. That better price, I am informed, the ryot does not at present obtain from the buyers on behalf of the big exporting firms such as Messrs. Ralli, and I should like those of you who come from Sátára and other districts where the foreign groundnut is grown to go back to your homes and tell the ryots that they ought to be getting better prices, based on the percentage of oil contained in their groundnut. These better prices they are all the more likely to obtain if oil factories are started in the district to compete with the agents of the exporting firms in the purchase of the seed. But I understood Mr. Bidikar to suggest that Government should help the establishment of factories with pecuniary assistance. That I think is beyond the range of practical politics.

Mr. Bidikar :—I appeal to the Bombay merchants.

The Chairman :—I do not know what the Bombay merchants may be inclined to do. They are most of them, I imagine, exporting firms, and may not view the establishment of oil factories with a friendly eye. The best chance lies, I expect, in local enterprise, and I earnestly trust that some of you may be bold enough to make an experiment in this direction. There could be no more satisfactory result of the work of the Department in introducing foreign oil-seeds into this country, than that the oil should be extracted here. It would be a complete reversal of the existing process which consists in the export of our valuable seeds, and the extraction of oil and utilisation of the cake or residue for manurial purposes in Europe. It would in fact be a "spoiling of the Egyptians" and true Swadeshi.

I wish to say a few more words on the forest question which has bulked largely in our discussion. It is not strictly speaking agricultural, but it evidently presses heavily on your minds. First I draw your attention to the resolution of Government recently published in the English newspapers on the subject. I am afraid it has not got into the vernacular papers, which seem seldom disposed to publish the matter which we place at their disposal. The resolution will prove to you how anxious Government are to take the people into their confidence on this subject, and that it should be understood that the restrictions, disagreeable and vexatious though they may be, are imposed in the true interests of the people. (Hear, hear.) I am glad to note that cheer, which I take to be an

admission that the restrictions are reasonable and necessary. The aim of the Government and of the Forest Department is now, whatever mistakes may have been made in the past, in the opposite direction, to get the people on their side and to help those people who live in the vicinity of the forests to make a livelihood; this is no empty profession or pious opinion. The thing has been done. There are parts of the Presidency such as Surat, Mándvi and the Dángs, in which the Forest Department have got the people wholly on their side.

In the Dángs in particular enormous areas used to be burnt out. Now however, by the judicious grant of concessions the co-operation of the people has been secured with the result that fires in the Dángs are almost unknown.

As regards the immense importance of the preservation of tree growth I should like to remind you of one or two important facts. The demand for timber and fuel in this Presidency is far short of the supply. As regards fuel you have the enormous city of Bombay with its million of inhabitants. The demand there has been so great that it has been necessary to go beyond the limits of the adjacent forest districts of Kolába and Thána and bring up supplies all the way from Kánara. Are you aware too that owing to the scarcity of timber you are actually importing for sleepers and building purposes jarrah wood from Australia? Government by conserving the forest is endeavouring to help you to supply yourselves with wood instead of importing it, and in so doing I claim that Government is acting in true "Swadeshi" interest. (Hear, hear.)

Now let us come to *ráb*, a question on which every one here, the people, the Department, and officials, all feel most strongly. Now in the first place, Dr. Mann has told you that the Department has discovered and is discovering manures for promoting the growth of rice which are no more expensive, and some probably less expensive than *ráb*. This discovery, I understand some of you to think, is not of much use for the cultivator. I quite understand this view. The discovery is of use to the man who has to pay for his *ráb*. But the cultivator himself probably does not pay for his *ráb*, he collects it himself by his own labour and the labour of his household. He has no money to pay for *ráb* or any other kind of manure. The discovery of a manure less expensive than *ráb* is of no use to him, nor is the substitution of a cheap manure for which he has to pay, for *ráb* for which he does not have to pay. But Dr. Mann hopes to discover something else which will help him. The idea is that the chief value of *ráb* is derived from the heat which it supplies. Dr. Mann hopes to show that the necessary heat can be given more economically than by the existing methods. In other words he hopes to show how equally good results will be obtainable with less *ráb*. If Dr. Mann succeeds in doing that he will give real relief to the cultivator, since he will be able, with the same amount of *ráb* and of labour in collecting it as at present, to get better results or to get the same results as at present with less labour. In other words the existing supply of *ráb* will be made to go further than at present. That will be a result of immense value.

In the next place I wish to correct the widely prevalent impression that by the operations of the Forest Department your supply of *ráb* is curtailed. Now that impression is, I believe, altogether mistaken. Indeed, the effect of forest conservation is to prevent the complete exhaustion of the *ráb* supply. And the proof is this. If the result of the forest operations were to extinguish *ráb* there would be least *ráb* in the districts where there is forest. But is that the case? I say it is not. There is one district in this Presidency in which there are no forests, I mean Ratnágiri. But that is the very district in which there is least forest growth and material for *ráb*. The effect of abolishing forest restrictions would be that Thána and Kolába would rapidly become as bare as Ratnágiri, and the existing supply of *ráb* materials would be enormously diminished.

The above remarks are intended to convince you, if possible, that the forest restrictions are imposed with the principal object of preserving and increasing the supply of wood for timber and fuel, and of *ráb* materials, and that the policy pursued is designed and carried out in the true interests of the people. At the

same time Government are on the alert to seize every possible opportunity to get rid and mitigate the hardship of forest restrictions, the extreme burdensomeness of which they most fully realise.

Complaints have been made of the damage done by pigs. It may be worth mentioning that in one district rewards have been given for the destruction of pigs. If good results ensue the system will be extended.

Perhaps the best discussion we have had in the Conference has been with reference to agricultural education. The chief impression which I derived was the great value set by every one, and the necessity realised, of imparting, in some form or other, vernacular education in agriculture to *bonâ fide* agriculturists. Some desired the instruction to be given in primary schools, some in secondary or special schools, and some that it should be given at the College. I can only say that action will be taken promptly on the suggestions made. The matter has already engaged the attention of Government; but we shall now go forward and in a very short time a beginning will be made in providing vernacular instruction in agriculture. At the same time I must point out that as has been stated here by Mr. Sharp, and as was stated by me at Ahmadabad Conference last year, it is essential that, in order to provide the teaching staff, we should have plenty of more students at the College. There are many young men fitted for agricultural careers who are started on other lines. I do hope that parents in considering what career or profession they should give to their sons will give a preference to the agricultural course. Now that certain modifications are to be made in the first year's curriculum, the course will not be inordinately difficult. It gives as good an opening for Government employment as any other, and the choice of it will provide a class of young men who are most urgently required in the interest of agricultural education and the good of the country. If I had a son in India and who had to be educated here I should certainly send him to the College. (Cheers.)

And here I should like to mention again the subject of scholarships. The matter is of the greatest importance. I venture to solicit most earnestly the help and support of all wealthy men who are philanthropically disposed for the grant of scholarships to be given to the sons of cultivators, men of the real cultivating class. Let donors place at the disposal of the Director of Agriculture or of the Government, on such terms as they please, sums of money for the foundation of such scholarships either in the College or in such agricultural schools as may be set up.

A few words on the subject of seed selection. It has been pointed out that while many cultivators select seed for themselves the great bulk do not, but buy their seed from the local dealer, who makes no selection. I appeal to some of you to make an endeavour to start a seed industry on the lines indicated by Mr. Keatinge. The promoter of such an industry should grow crops not merely for food purposes, but expressly for seed. He should make efficient arrangements for storage and then should sell the superior grain which he has stored for seed purposes alone. He will be entitled to demand a higher price and will obtain it in course of time if not immediately, that is to say, as soon as his produce has acquired a reputation for quality and the production of good crops in the land on which it is employed. There are, I am sure, many of you who are in a position to start a business of this kind. Do let me hear, gentlemen, before next year's Conference that some one has had the courage and enterprize to take the matter up.

I do not propose to say anything on the merits of the questions which have been discussed in relation to agricultural banking. But I should like to remove a misapprehension. It is believed in many quarters that there is an intention to bring in foreign capital to start an agricultural bank. I should like you to know that one of the principal merits which Government found in Sir Vithaldas Thackersey's scheme was that the capital was to be wholly found in this country. (Hear, hear.) That is our desire. Indeed there is nothing we should like more than that the capital should all be procured from the *sâvkârs* themselves. (Hear, hear.) Now if the *sâvkâr* feels assured that he will recover his money he will abate his interest. If he will abate his interest, his money will be in greater demand. These organised concerns will ensure better recovery and fewer bad debts, and the substantial *sâvkâr* will find it pay him to

place his money in these concerns at moderate rates of interest, rather than deal with a scattered clientele, and incur many bad debts for which he can only recoup himself by charging heavy rates of interest all round. Once we can impress the *śāhār* that schemes of the kind will be to his pecuniary advantage he will not be slow to invest in them. It will, I am sure, interest you to know that with regard to Sir Vithaldas and Mr. Lallubhai's banking scheme, that we have recently received a communication from the Government of India which affords sanguine hopes that the scheme may go through.

There is one little matter which I mention at the request of Mr Keatinge, viz., that a great many papers have been submitted which it has not been possible to read; their contents however will be analysed and scrutinised and summaries of them will be included in the proceedings of the Conference.

And now, gentlemen, I must conclude with a few words of what is I fear farewell. This is the last Conference at which I can hope to preside (cries of no, no) for I believe I leave on the 5th August 1910. Well, gentlemen, I can only say that while the severance of my years-long tie with India will be intense sorrow to me there is no part of my work which I shall relinquish with sorer reluctance than that which is connected with agriculture. There is however one great consolation, viz., that when I quit the country I shall leave its agriculture on an upward path of steady improvement (hear, hear) with Government, and the Department and the people enthusiastically co-operating in the promotion of its success. (Cheers.) There is no longer any danger of a swing of the pendulum. The usefulness of the work that the Department is doing and can do has been demonstrated not only to the Government, but, as I think this Conference has shown, to the people; both the Government and the people will insist together on the development of that work. We have plenty of men in the public service, both inside and outside the Department, full of life and energy, and faith in the value of the work to be done. Among these men I include Indians no less than Europeans. And among the people we have many private individuals, men of intelligence and enlightenment, who are coming, or have come, to see what can be done by the Department with their help and co-operation. Whatever other vicissitude may be in store for India her agriculture, I am convinced, will not go backward. A great comet will shortly be visiting the regions within the limits of our vision. Many persons regard these celestial visitors as harbingers of calamity and disaster. I entertain no such gloomy anticipations; on the contrary I hail its glorious refulgence as an omen full of promise for the future of political unity, abundant seasons and agricultural prosperity.

On the motion of the Chief of Ichalkaranji a vote of thanks was passed to the Chairman and to the members of the Agricultural Department.

In addition to the discussion which took place a large number of suggestions were submitted in writing. Many of these suggestions deal with matters which were discussed at the Conference, such as Agricultural Education and an extension of demonstration farms and seed stores; in some cases mentioning localities in special need of these facilities. Other suggestions deal with the necessity for constructing public works in the particular localities such as tanks, canals, light railways, piers, etc. Others deal with matters indirectly connected with agriculture, such as free and compulsory education, the introduction of permanent settlement, a more elastic system of takávi advances, and prohibition of the slaughter of cattle.

Amongst the written suggestions more directly connected with agricultural advancement were the following:—

1. Encouragement to construct *táls* and bunds to conserve surface water and silt and prevent erosion (Mr. R. P. Karandikar of Sátára and Mr. K. G. Kalghatgi of Dhárwár).
2. Encouragement of well boring, and increased facilities for well boring operations (Mr. G. R. Tilak of Bágalkot, Mr. Indulal Chimanlal of Ahmedabad and Mr. D. E. Wacha of Bombay).
3. Stringent measures necessary to check stray cattle from towns in Gujarát (Mr. Girdhardas Mangaldas Desai of Nadiád).

4. That arrangement be made to allow cultivators to take salt or salt earth free of tax to manure cocoanut and mango trees (Mr. B. V. Pathekji of Surat and Mr. R. V. Padhidri of Kumpta).

5. That vernacular text books be prepared dealing with particular branches of agriculture, agricultural engineering, etc. (Mr. D. E. Wacha of Bombay and Mr. S. M. Desai of Mahuda).

6. That measures be taken to stop the adulteration of wheat and linseed in India which gives the Indian crops a bad name and reduces their price (Mr. R. P. Karandikar of Sátára).

7. That intelligent cultivators of one tract be taken occasionally to see high class cultivation in another tract (Mr. D. E. Wacha of Bombay).

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PROCEEDINGS

OF THE

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AGRICULTURAL CONFERENCE

HELD AT

POONA

ON THE

15th to 17th September 1913.

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B.P. 49

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PRESENT :

His Excellency the Right Hon'ble Freeman Freeman Thomas Baron Willingdon of Rutton, G.C.I.E. (in the chair).

The Hon'ble Sir Richard Amphlett Lamb, K.C.S.I., C.I.E., I. C. S., Member of Council.

The Hon'ble Mr. Prabhaskar D. Pattani, C.I.E., Member of Council.

The Hon'ble Mr. G. Carmichael, C.S.I., I. C. S., Chief Secretary to Government.

The Hon'ble Mr. S. R. Arthur, I. C. S., Commissioner, C. D.

The Hon'ble Mr. B. S. Kámat, B.A.

The Hon'ble Ráo Sáheb V. S. Náik.

The Hon'ble Mr. K. R. Godbole.

The Hon'ble Ráo Bahádur S. K. Rodda.

A large number of Jahágirdárs and Sardárs.

Officers of the Agricultural Department of Bombay Presidency, of the Imperial Department of Agriculture, and of the Revenue Department.

Representatives of the Bombay Chamber of Commerce, the Mill Owners' Associations of Bombay and Ahmedabad, and many Agricultural Associations.

About 300 landed proprietors and gentlemen interested in Agriculture, drawn from every District in the Presidency Proper.

MEMBERS OF THE MANAGING COMMITTEE OF THE
CONFERENCE.

Official.

W. W. Smart, Esquire, B.A. (Oxon.), Dip. Agriculture (Cantab.), I. C. S., Acting Director of Agriculture (Chairman).

R. B. Ewbank, B.A. (Oxon.), I. C. S., Registrar, Co-operative Societies.

Dr. H. H. Maun, D.Sc., Principal, Agricultural College, Poona.

Prof. J. B. Knight, M.Sc., Professor of Agriculture.

Prof. William Burns, B.Sc. (Edin.), Economic Botanist.

K. H. Gokhle, Esquire, Acting Personal Assistant to the Director of Agriculture.

Non-official.

The Hon'ble Mr. B. S. Kámat.

Sardár Ráo Bahádur Cooposwamy Moodliár.

In opening the proceedings of the Agricultural Conference His Excellency Lord Willingdon, the Governor of Bombay, delivered the following address:—
 Gentlemen,—Let me say in the first place that it gives me immense pleasure to be here this morning and to have an opportunity of meeting this large and influential gathering of those who are mainly and, I hope, intensely interested in the great question of agriculture in this country. My one regret arises from this fact that I shall be unable, owing to other engagements, to attend the three days' Conference that you propose to hold. I had hoped I would be able to take part in the many interesting discussions that will be raised during the next two days, but I have discovered this already, in my short career as Governor of Bombay, that if the Governor is going to do everything he wants to do, he will have to divide himself up into several pieces. (Laughter.) I hope you will believe me when I say this, that my absence from your Conference does not mean any want of interest on my part, and I assure you I shall follow all your discussions day by day in the hope that they may be of extreme value to the improvement and progress of that great industry which we are here met together to promote. I want to say another thing to you. I look upon this as a business meeting. I am not here to make a long speech. I am here to learn and not to teach. It is perfectly true that in England I have had some experience about agriculture, but it is also perfectly true that I have had very little experience of agriculture in India, and, I think, you will agree that it would be almost ridiculous for me, with my very short experience, to lay down propositions to you, who have, for many years, been interested in this industry in this country. Nevertheless, I am going to make one or two general observations, and I want to say for the safety of my honourable colleagues and my Government, that whatever I say is my individual opinion and I do not want to compromise them in any way. They and you may think that my individual opinions are wild and idealistic opinions, and, therefore, whatever I say—and I say everything today with the utmost diffidence for the reason I have told you—expresses my personal opinions and not the opinions at the moment—perhaps, they may be in the future—of the Government as a whole.

A SATISFACTORY MONSOON.

In the first place, I think, we may congratulate ourselves, up to the present, on having a satisfactory monsoon. It is a matter of great satisfaction to myself, as coming out new among you, to feel that the start of my administration should be under such prosperous condition. We are waiting for those refreshing showers which, I hope, will come in the next few days and freshen up the crops and make everything satisfactory—satisfactory so far as the monsoon is concerned. I realise, even in the short time I have been here, how absolutely dependent we are in this country on our water-supply—either on the rain from the heavens or on that conservation of water for irrigation, that has to such an enormous extent, reduced the horrors of famine which exist in this country, and I think a word of praise is due to our engineers in the past and in the present, who have done and are doing so ~~enormous~~ a work to minimise the horrors of famine and to bring practical agriculture within the range of so many thousands of acres of arable land in the last few years.

Splendid

EDUCATIONAL WORK AND THE AGRICULTURAL COLLEGE.

Now, when I read this list of papers that are to be dealt with at the Conference, I realise at once, and I realise it with great satisfaction, the very large experimental and educational work that is going on in India at this time, and ~~that~~ I hope that these experimental works and the discussions you are going to have on them to-day with regard to crops, with regard to irrigation, with regard to manure, with regard to the use and conservation of fodder—most important in this country—will be most useful. All these and other kindred questions, I hope, will be carefully discussed and that you will be able to

give good and useful information to Government in the near future. With regard to educational matters, I have had an opportunity of visiting an institution which, after my visit, I came to the conclusion was admirably managed by Dr. Harold Mann and his assistants. (Hear, hear.) I refer to the Agricultural College. (Cheers.) I am not quite sure that as far as technical education is concerned—and this is a form of technical education—the Poona Agricultural College is not deserving of more support than any other technical institution in this country, for it produces young men who have a scientific knowledge of the largest industry that exists in this country, and, therefore, let me say here that the College will have my keen sympathy and assistance in the future. (Hear, hear.) I notice that there are vernacular schools being started in various parts of the country owing to the generosity of a few gentlemen to whom I must express my sincere thanks. They are started for the general instruction and education of people in the most useful in the main principles of agriculture. I wish all success to them. I hope they may increase in number; for all such efforts to promote and encourage agriculture anywhere should be helped forward by every means in our power.

STOCK-RAISING.

Much has been said and much has been written in the various papers we have before us with regard to the improvement of crops, to the improvement of agriculture, to the improvement of machinery and to the improvement of horticulture; but I have noticed very little with regard to the question of stock-raising and with regard to the starting of stock-raising institutions. I am always told, for I have asked a good many people questions on this matter, that people in India only grow cattle, or mainly grow cattle, for the purpose of using them as draft animals and pay no particular attention to growing cattle for any other purpose. I don't know if any of you have read the most interesting, the most instructive, and the most suggestive paper which has been written for this Conference by Dr. Harold Mann on 'The supply of milk to Indian cities.' If you have, I think you are bound to agree with him, that we must all combine in endeavouring to improve the dairy cattle and generally dairy farming in this country. I know perfectly well that there are great difficulties in the way, that there are great prejudices to meet. Let me say here that I know something of Africa and Australia, where difficulties, I think, just as great, have been met and overcome, and that I believe difficulties here will also be overcome. I believe the prejudices will disappear, directly the people discover that what is proposed is meant not only for their own good and their own personal advantage, but for the general benefit of agriculture through the country. You will ask me this: 'How are you going to bring this state of things about?' I hope you will agree from what I am going to suggest this morning that I think it ought to be brought about in a practical manner. I hope Government may set an example by selecting good cows, locally bred and by crossing them with imported bulls specially chosen in order to improve the quality of the dairy cattle in the country, and I trust that this example may stimulate others to do the same.

HOME FARM AT GANESHKIND.

You are probably aware—and as I am here I want to express my sincere thanks both to Mr. Carmichael and Mr. Smart for the assistance they have given me in this matter—the Governor has started a home farm at Ganesh-kind. I am going to try to breed the highest classes of Sindhi cattle, and to make the herd, if I can, a foundation stock for that special breed after careful selection, and I believe that I shall get excellent results. (Cheers.) You may say—it is quite probable—that as I have been a farmer at home,

that I am doing this merely for my own personal amusement, but believe me, that is not my reason for starting this experiment. I want to set an example to other people and I hope very much that that example will be followed by many landholders of this country, great Chiefs, Sirdars, and those who are interested in the occupation and ownership of land. I would like to see them start with pedigree cattle, and I believe, that their example will influence their tenants in every district in the country; and by degrees we shall secure not only much better cattle, but we shall be able to supply pure milk to the people. There is another thing. I think the establishment of such home breeding farms will not only encourage a great interest in stock-raising, but incidentally they will give employment to a great many young men, who will become managers of these farms, and further they will give the landowner a real knowledge of a practical sympathy with the wants and requirements of the many difficulties which beset his agricultural tenants. My idea is that in future the great landowners should have their breeding farms for breeding the very best cows from stud bulls, so as to have really good milking dairy cattle. Then I hope to see agricultural shows springing up in every direction. You have many such shows, of course, but I want to see them much more general and to find the Governor, Chiefs and Sirdars and farmers themselves—all competing for prizes for the best and highest quality of cattle in the future.

THE MILK SUPPLY.

There is another reason why I want to encourage the dairy farms. I have referred to Dr. Mann's paper. I think, if you read it, it discloses a very serious state of things. It shows perfectly clearly that the milk supply in our cities is in most cases adulterated and that the sanitary conditions under which that milk is produced are of the worst possible kind. Now, I say this as Governor of this Presidency, that for the health of our people and for the welfare of their children we must insist that they are supplied with absolutely pure milk at a reasonable rate. (Hear, hear.) And I leave this question with you to-day in the profound hope that your discussion may be of such value, that you will give some important information to Government in order that they may take action in the near future.

PROPOSED TOUR OF HIS EXCELLENCY.

I am glad to say that in a few weeks' time I shall have an opportunity of touring in the southern part of the Presidency and of seeing in the Dhárwár District experiments in steam-ploughing, which, I hope, will be of the greatest advantage to agriculture. The steam-plough will operate on a considerably larger area than the ordinary cattle can possibly deal with; and there are great possibilities of opening out more tracts of country for agricultural purposes. In this connection I feel that we owe a word of deep thanks to Sir Sassoon David, (cheers) for his endowment towards agricultural education and towards agricultural development generally.

COMPETITION IN AGRICULTURAL INDUSTRIES AND HOW TO MEET IT.

Competition in all industries is getting keener every day; and competition in the agricultural industry is getting just as keen as in any other. We are now a large competitor in the markets of the world. We can only succeed in keeping our place by keeping pace with all the best methods of cultivation and marketing which are in existence now in Europe and America, in Japan and all great agricultural countries. How shall we achieve this end?

CO-OPERATION.

I believe that we shall best do it by co-operation. I hope to see individual farmers joining together for the provision of good seed, of the latest forms of implements and labour-saving machines, for the purpose of buying manures and feeding cakes and for various other purposes and I trust the Agricultural Department will always work hand in hand with the co-operative movement; they have a common interest, a common object in view. This is all I have to say. I am fully aware that I have only touched the fringe of the many important subjects we have got to deal with in this Conference, but hope you will believe that I am fully alive to the immense importance of agricultural development and trust with all my heart that during my term of office we may be able to take a very great step forward in that vast industry, which gives occupation and employment to the enormous masses of the whole of the Bombay Presidency. (Loud applause.)

After His Excellency the Governor had resumed his seat Mr. Smart, the Acting Director of Agriculture, spoke as follows:—Your Excellency and gentlemen, I am going to confine my remarks to some of the points which I omitted from my review already submitted. The first is that I have omitted all reference to Sind—that province where I have spent most of my service and whose welfare is very dear to me. The omission was intentional, because I am aware that it is regarded as very remote by the inhabitants of this Presidency, but I can assure you that the Agricultural Department has been very active there, especially since I have acted as Director. Last year two new farms have been started and a third one of 200 acres for cotton and Egyptian, Clover seed is to be established this year. A Vernacular Agricultural School was opened last year at Mirpurkhas and many sub-stations have been established since the last Conference. Forty tons of American Cotton seed have been sown this season and a Bombay Syndicate have built two factories for dealing with the produce.

The second point which I desire to emphasise, is the intimate connection in this Presidency between the Co-operative movement and the Department of Agriculture. The passing of the new Co-operative Societies Act in January 1912 has opened up a vast field for the activities of Co-operative Societies in this Presidency. Mr. Gonehalli has indicated in his paper some of the lines which Co-operation in Agriculture may take, and has taken already, in this Presidency. I want to see Bombay taking the lead in starting sound Co-operative Societies for purposes other than those of credit. Without Co-operation successful agriculture in a land of small holders is impossible and with Co-operation most of the disadvantages attached to small holdings disappear.

That is why my friend Mr. Ewbank and myself and the officers subordinate to both of us have endeavoured to work hand in hand. That is why the Agricultural Department tries to help Co-operative Societies and the Registrar sends lecturers to Agricultural Shows and that is why the Agricultural and Co-operative Conferences are being held in the same week.

The Civil Veterinary Department is the other branch of this Department. We are far behind some other provinces in the matter of staff and dispensaries, but I hope that our deficiencies will be made up before many years have passed. Colonel Maxwell and I are submitting proposals for the expansion of the Department which should go far to improve matters. I have no more to say, gentlemen, except to thank you for coming—many of you from long distances. I hope sincerely that this Conference will be a success, and that we have not merely come here to discuss, but that some definite result for the benefit of the Department will ensue. It is for this reason we have invited a limited number of persons this year, and have made a new departure; for instead of having a two days' discussion in a general meeting, we are going to appoint suitable sub-committees to sit and frame recommendations for the consideration of the general Conference. Gentlemen, it is my wish that the officers of this

Department should listen with patience and respect to the criticisms and suggestions of practical agriculturists, who may approach the subject from its commercial side and whose business it is to obtain a living from agriculture. There is a complaint that we are neglecting the commercial side of agriculture. Gentlemen, our officers are here to-day to listen to your suggestions from a practical point of view. Our object in carrying on experiments, is to arrive at some definite improvements for the benefit of actual cultivators. I hope that every one in this Conference—the officers of the Department and other gentlemen—will obtain some valuable results from the discussion. If the officers of the Department give a patient hearing to your suggestions, gentlemen, and if you co-operate with them, our work here will be both genuine and satisfactory, and the result will be that this Conference will be a great success.

PRESENTATION OF PAPERS BEFORE THE CONFERENCE BY THEIR AUTHORS.

Dr. Mann, Principal, Agricultural College, Poona, observed thus:—Your Excellency and gentlemen, I beg to lay before you some views as regards the milk-supply in the Indian cities. The figures, on which I base the conclusions which I want to place before you, were obtained during the investigations made lately and are limited to the supply in one city, namely, the city in which we meet to-day. I have the honour to be a member of the Poona City Municipality, and as Chairman of the Sanitary Committee a few years ago, I was struck with the unusual infant mortality in the city. It came to about 60 per cent. of the total mortality. A special Committee was appointed to inquire into the causes of this high rate of infant mortality. Although the Committee's deliberations are not made public, I have got these figures and facts, at any rate, and one of the chief causes of the excessive infant mortality in the city was found to be the exceedingly bad quality of milk: 80 per cent. of milk which is sold in Poona is adulterated. More than half of the quantity of milk sold is water. But apart from that the price paid for that milk is exceedingly high. The price paid for it is very high compared with what we have to pay in an English city. And this price is obtained from people who are exceedingly poor. The question of milk-supply in Indian cities is one of extreme importance. We have to find out a method whereby we can obtain large quantities of good milk without, at the same time, raising their price. That is the problem before us. To me three methods occur, by means of which the question may be tackled. I hope this matter will be considered to-morrow by the Sub-Committee. One of my methods has already been referred to by your Excellency, *viz.*, the improvement of dairy-stock. Our cows give us only five pounds of milk a piece per day and our agricultural buffaloes give ten pounds a piece per day. In order to get the best milk we must have the best stock of animals available. We have in Poona, at present, an excellent military dairy and it is successful. The supply of milk given by one animal there is from 10 to 35 pounds per day. By making similar arrangements we can increase the supply of milk in other places and sell at a cheaper price than the one now charged. The second method is to organise a system whereby milk could be conveyed to the city. At present, according to our statistics, no less than 350 people are engaged in carrying milk to the city, each one carrying 16 pounds only; that is to say, we have 350 people wasting the whole day by going round the city with their small quantities of milk. Hence, you should have an organisation, whereby milk could be taken to the city in a more economical manner. The third point is this. A greater part of the milk supply in our city is from animals located in dirty and insanitary sheds—small sheds—in the lowest quarters of the city. Consequently you have cattle living in the most unhealthy, unsuitable and unsatisfactory conditions. Then, you have to carry fodder to them and to milk them in places where it is bound to be unhealthy. That is why you have cattle in the most unhealthy condition. And yet you have to pay a high price for milk obtained from these animals. I think that condition of things need not go on any longer. We should have a proper and an adequate organisation for supplying milk in our cities. There is another point. A very interesting experiment has been made by the

Military Dairy here in contracting to supply milk to certain hospitals in Bombay. The Dairy has been able to do so without a single failure and without the milk going bad on any single occasion. The price, again, is very low as compared with what is paid for good milk in Poona. If adequate and good arrangements, are made with the Railway, whereby milk could be transported from Poona, a large quantity of good milk can be sent to Bombay at a lower cost than one gets it at in Poona itself. These are the three methods which I want to place before you. There may be some difficulties in the application of these methods. I have suggested them, as by their means, this serious question can be tackled. (Cheers.)

Prof. Knight of the Agricultural College, Poona, addressed the Conference in these terms :—Your Excellency and gentlemen, there is very little that I have to say with regard to my paper. Mr. Mahajan, Superintendent of the Manjri farm, furnished some of the details and I wish his name to be associated with its preparation. The only other thing that I wish to say to you is about the practical demonstrations that will be given on Wednesday morning. I ask you to read my paper carefully, and when you come to the demonstrations on Wednesday morning, I will try to explain to you several points in the paper to your satisfaction.

Prof. Burns of the Agricultural College, Poona, said :—Your Excellency and gentlemen, my paper contains a statement of facts embodying the results of the experiments and observations made during the last three years. I am also appealing for information, because we have not been able to deal with a great many of the factors of this question. The question of soil and the question of stock have, however, I think, been dealt with in some detail. From that you will be able to form your own opinion on this point. I would like to bring to your notice that this question is one in which the owners of gardens can materially assist us in the solution of the problem. If you will allow us to experiment on your plantations, the result will be much more quickly got, and reliable experiments can be carried on in several places. We have to deal with the question from the commercial point of view taking into consideration the questions of the outturn and transport. We shall be exceedingly obliged by your opinions on these points.

Mr. Schutte, Mechanical Engineer, Agricultural College, Poona, observed as follows :—Your Excellency and gentlemen, in presenting this paper to the Conference I would like to bring to your notice the great advantage derived from power pumps in irrigation. I am anxious to co-operate with cultivators by bringing before them these machines. With their help a larger area will be brought under cultivation eventually. I can show to the cultivators at the Demonstration to-morrow engines and pumps working, and I hope to prove that the machines are quite beneficial to the cultivators.

Mr. V. H. Gonehalli, M.A. (Cantab.), Extra Deputy Director of Agriculture, Konkan Division, Ratnágiri, spoke as follows in presenting his paper on the 'Development of Co-operation in Agriculture':—Your Excellency and gentlemen, with the permission of the Managing Committee of this Conference I am presenting to you my paper on the development of co-operation in agriculture. In Europe the practice of co-operation has conferred great benefits upon the peasant proprietors and small farmers like our own rayats. Even in India the success achieved by the co-operative movement, since the passing of the Co-operative Act of 1904, is great and fills one with the hope that the rayats of this country, too, will one day be as great and prosperous as those of Western countries.

The object of my paper, gentlemen, is twofold; first, to urge on you, whom I regard as a band of agricultural reformers, to take an active part in the work of overspreading the country with a vast network of Credit Societies, and thereby solving the question of rural indebtedness. My second object is to ask you to help the officials in extending the co-operative movement to the organisation of the various branches of the business of agriculture. I invite you to help us to start societies for purchasing manure and other requisites and for supplying seed and food grains to cultivators, to give an impetus

to the development of the milk industry by organising milk producers; and to organise the sale of cultivators' produce, and so on.

To my mind, gentlemen, it appears that agricultural reformers have before them two issues to solve. They have to carry on research work at the Agricultural College, at the laboratories and at the experimental stations; and find out improvements. But when an improvement has been found out, there is one, probably only one, effective method of incorporating it into the routine of husbandry, and that is the co-operative organisation of cultivators for the introduction of the particular improvement in view. In this work of preaching co-operation and starting societies, you have an important part to play and great success to achieve by co-operating with the officials of the Department.

Gentlemen, the subject of co-operation has received careful consideration at the hands of Government. In order to show what great and paramount importance Government attach to this subject I would quote for you the inspiring words addressed last year to the Co-operative Conference by Lord Sydenham. On that occasion His Excellency said: 'Habits of thrift, the value of collective credit dependent upon honesty and business capacity, the advantages of corporate action involving mutual confidence, the dignity and self-respect inculcated by self-help, and the legitimate pride engendered by membership of a successful association—these are just the lessons which Indians should be taught, because they can help to impart the true spirit of nationhood.'

Gentlemen, in presenting my paper to this Conference I trust that the suggestions made by me will lead to a wide discussion of the subject and stimulate you to identify yourselves with the co-operative movement of this Presidency, which is under the guidance and control of Mr. Ewbank, our Registrar.

I now present to you my paper.

Ráo Sáheb G. K. Kelkar, Extra Deputy Director of Agriculture, Bombay Presidency, said as follows in presenting his paper on 'Uses of improved implements in farming':—Your Excellency, Sirdárs and gentlemen, I venture to present you a paper on 'Improved Implements.' The greatest good that the Agricultural department can do the agriculturists is, to help them in the performance of their work in an excellent manner. Improved agricultural implements are necessary not only in the preparation of land, but also in the maintenance of the condition of the soil, weeding of crops and afterwards in threshing and marketing them. During the last fifty years a vast change has taken place and all the valuable, good and inferior soil has been brought under the plough. The increase in population, creating a larger demand for food-grains, has resulted in the inefficient cultivation of land. More than one-third of the area of dry crops in the Deccan and the Karnatic has been taken possession of by weeds like 'Hariali,' and several others. The proper remedy against this state of things is an efficient preparation of the land. There are three prominent factors to be noticed in the preparation of land. First, you must have a good soil. Secondly, there must be good seed. Thirdly, there should be a good preparation of land. These are some of the important factors to be considered in bettering the condition of the soil as well as in increasing the production. In the year 1883 the Agricultural Department was first formed, and since then various methods have been tried and tested at the Agricultural Stations and very valuable information, in connection with seeds, manure and implements has been obtained. The principal difficulty, however, is how to bring this information to the doors of the agriculturists. Some efforts are being made to popularize the agricultural implements by means of Demonstration and Shows and Exhibitions and also by doing some work in the presence of visitors. The popularization is further carried on by stocking and selling the implements at cost price, and also by hiring them at particular centres in the Deccan and the Karnatic. Nevertheless, looking to the vastness of the country the Agricultural Department can do but little. This defect needs to be removed, and the remedy for it is in the hands.

of the Sirdárs, the leaders of the people and the members of Agricultural Associations and Co-operative Societies. The leaders of the people can reach the cultivators by giving them information through bulletins and leaflets. They can also purchase and supply implements to the cultivators, they can start factories for the repair of the implements and they can store spare parts of the implements. Of course, there are several difficulties in the way of leaders of the people in dealing with these implements. The first difficulty is the high price of them. The second difficulty is regarding the repairs of the implements. The third difficulty is the ignorance and apathy of cultivators, and the fourth difficulty is that the cultivators do not like to leave their old customs and adopt new ones. But, gentlemen, once they are satisfied as regards the value of the new methods, they are never slow to adopt them. I will give specific instances on this point. The Ransomes C. T³ plough you will find in almost every village within a radius of ten miles. Its superiority over the indigenous plough lies in the fact that it ploughs one acre of land in two days with two good pairs or three ordinary pairs of oxen, whereas the indigenous plough takes three days to turn out the same amount of work in spite of an extra pair of bullocks. Not only this, but the work done with the indigenous plough is incomplete; it needs cross ploughing to accomplish similar work as performed by one ploughing of a good Turn Wrest Plough. The furrow, opened by the indigenous implement being V-shaped, leaves unploughed land between the furrows, whereas the Turn Wrest Plough makes rectangular furrows and completely turns over the soil. The 'Balance Gear Plough', manufactured by Messrs. A. Bajac & Co., of France, is much appreciated by cultivators in the Karnatic and Gujarát. In order to bring this knowledge within the reach of the cultivators one wants real workers, that is, workers, who have sympathy for cultivators, who have faith in improvements and who have the good of the country at heart. I can take it that all those, who are present here, have sympathy for the poor agriculturists. One word more and I have done. Gentlemen, to-morrow morning at 8-30 there is a Demonstration at the Agricultural College, where most of the improved implements as well as appliances have been arranged by Prof. Knight with the help of certain people, and where you will be able to learn much and collect a good deal of information, so that in one day's time you will have that knowledge which you cannot get by looking at pictures or by reading books, which cannot fully describe the various things that you will see in the Demonstrations. With these words, gentlemen, I beg to present this paper to this Conference.

Ráo Sáheb M. L. Kulkarni, Divisional Inspector of Agriculture, S. D., addressed the Conference in the following terms while presenting his paper on 'The scope for the extension of Broach cotton in the Southern Division.' He said:—Your Excellency and gentlemen, in presenting this paper before the Conference I beg to observe that the cultivators are satisfied with the good growth of Broach cotton and the merchants are satisfied with the good quality of the cotton. The only thing is that it is necessary to induce cultivators to go in for the cultivation of this type of cotton to a greater extent than now by showing to them the millowners' wish to have this good cotton in the Southern Maratha country by paying higher prices. With this inducement cultivators will try to produce a greater proportion of Broach cotton in the Southern Division. They are sure to make profits to the extent of some lákhs, if they produce as good a cotton as is raised in Broach and Navsári.

Mr. G. B. Patwardhan, Acting Assistant Professor of Botany, Agricultural College, Poona, made the following remarks while presenting to the Conference his paper on 'Horticultural possibilities of Western India.' :—Your Excellency and gentlemen, in submitting this paper before you I would say that though our country is the oldest one, people in it are backward in the matter of improving the growth and quality of our fruits and flowers.

The number of proofs which I can cite in support of this statement is legion, and I do not propose to give them all here. I would, however, mention one broad fact to maintain what I say. In Western countries there are associations for promoting horticulture, but in this country none such exist.

Mr. S. L. Ajrekar, Assistant Professor of Mycology, Agricultural College, Poona, in presenting his paper on 'Fungoid diseases of plants and the work done in the Bombay Presidency in connection with them' remarked:—Your Excellency and gentlemen, I admit that the subject on which I have written this paper is a very obscure one, but although it is so obscure I may tell you that it is an extremely important one. You will realise the importance by looking at the figures which I have given at page 3 of the paper. I say there that some estimates have been made of the amount of damage due to fungoid diseases in various countries.

Thus :—

	Rs.
Annual loss from wheat rust in India	4,00,00,000
Annual loss from wheat rust in Australia	3,00,00,000
Annual loss from wheat rust and smut of oats in America... .	5,00,00,000

These figures are startling and bring forcibly to our minds the importance of the study of these parasitic organisms. Gentlemen, I am glad to notice that another paper is going to be presented to this Conference by Mr. Gole of Nasik, which has a bearing on this important subject. He speaks from personal experience and his suggestions will make it possible for us to avoid the loss caused by fungoid diseases.

Mr. E. W. Horn, Manager, Government Civil Dairy, Poona, in presenting his paper on "The feeding of prickly pears and Cotton hulls" said as follows:—Your Excellency and gentlemen, in presenting my paper on this subject I think, there are very few remarks, to make. The paper contains details of experiments made in connection with the feeding of prickly pear and cotton hulls. The prickly pear was fed to six bullocks at the Civil Dairy. These bullocks were purchased for the purpose from the famine-stricken district of Ahmednagar. It was found that it could improve the condition of these bullocks. The experiments were made with these bullocks most carefully and they were not allowed to eat anything else except 6 per cent cotton seed. They were not allowed to be loose from first to last. With regard to experiments made with cotton seed hulls and cotton seed meal the cattle were divided into groups, 8 cows and 8 buffaloes in milk being selected from the dairy herd. The result of the feeding showed that there is little or no difference between the feeding value of hulls and karbi and comparison of prices must decide which is more economical.

Mr. V. G. Gokhale, Superintendent, Agricultural College Farm, presented to the Conference his paper on the 'Progress of cotton improvement on College Farm' with the following remarks:—Your Excellency, Sirdars and gentlemen, the principles on which the College Farm is dealing with this question are three, viz.—

1. Seed improvement.
2. Extension of cotton produce in the Deccan.
3. Extension of separate varieties of cotton in the Deccan.

With regard to the first point, it has been brought out very clearly by the investigations of Mr. G. D. Mehta that in the cotton seeds, that have been used in this Presidency, the germination percentage averages only about fifty-six per cent. That means that in getting a good crop we have to put about twice the quantity of cotton seed which otherwise would be required. The cotton seed to be used must be of some vigour. My object in this paper here is to point out that a good deal of improvement can be effected by the machine which has been worked out by Mr. Mehta and myself for the preparation of cotton seed. The machine separates the light seed from the heavy and thus increases the percentage of germination from 35 to 84 per cent. Not only that, but when we further experimented upon the separated and unseparated seeds in the field, not only were improvements observed in the germination, but the plant that germinated from the separated seed was also observed to yield much more than the one germinated from unseparated seed. The improvement I have been able to achieve is from 20 to 77 per cent. I have considered how this cotton-separating machine can be introduced on a large scale in order to give our culti-

vators good seed. Good seed would be a great boon to the cotton cultivators of our Presidency, which is a very important cotton-growing Presidency. The next thing that I have brought out is that there is a great possibility of extending cotton cultivation in the Deccan District. So far much has not been done in this line, and suitable varieties have not been tried. The experiments made on the College Farm have resulted in showing that within the last six years good results have been obtained with "Varádi" cotton. We have been experimenting to see which will be the most suitable types of Khándesh mixture that can be successful in the Deccan, and we find here again that the '*neglectum roseum*' variety gives a larger money return in spite of the low quality that we may produce. It gives ultimately the largest money value to the cultivators. There is one point more and that is with regard to Broach cotton. Some years ago the British Cotton Growing Association carried on experiments in the cultivation of Broach cotton in the Deccan by means of irrigation, and, I think, the experiments have been more or less a failure, but our experiments on the College Farm have brought out that even Broach cotton, sown under particular conditions, gives a large outturn. I have made experiments in Broach cotton in years when the rainfall extended from 13 to 39 inches, and our outturn always varied from 500 to 1,200 pounds of seed cotton per acre. There is one point that we have brought forward, that in the case of Broach cotton we must take the greatest possible care about its cultivation. Under these conditions you will be able to get successful results with Broach cotton. Another thing is, that wherever Broach cotton is to be brought under irrigation, we always take care that we never over-irrigate, because over-irrigation ruins the plant. It has the tendency to stimulate cotton to vegetative growth at the cost of bolls and to prolong the maturing period. The outturn also is reduced. The quality of lint is also reduced. This is according to our experiments made on the Mánjri Farm. I think this must have been the cause of failure on the part of the British Cotton Growing Association that I just referred to.

Mr. S. V. Shevde, L. Ag., and Superintendent, Dhárwár Agricultural Station, delivered the following speech in presenting to the Conference his paper on 'Improvement of cotton in the Southern Mahrátta Country':—Your Excellency and gentlemen, my paper concerns mostly those that are stationed in the Southern Marátha Country, but I hope there are many points in it which are of general interest also. First, I have referred to the circumstance that there are two types of cotton which are distinct from one another. When the two types of cotton, which differ and require quite different conditions of soil, are mixed and their seeds are sown in the same soil the result is not profitable to cultivators, because, the land which is suitable to one type of cotton is probably not suitable to the other type of cotton. Cotton which is suitable to one kind of soil is not suitable to another kind of soil. The evil is due to the fact that the cultivators purchase seeds for sowing from ginning factories, where the two types of cotton are generally ginned together and the seed gets mixed. This undesirable state of things ought to be improved. That is one of my suggestions in this paper. Another point I have laid stress on in the paper is, that with the object of giving pure seed to cultivators for sowing, there should be formed associations or societies, such associations and such societies as the present Dhárwár District Agricultural Association, which is distributing pure Kmpta cotton seed every year of the value of about Rs. 500. or Rs. 600. But that is not sufficient for meeting the demand of the cultivators, and I have suggested in my paper that there should be many more institutions like this. I have also suggested that the system of sowing the cotton seed should be improved. For the present the system which is followed by the cultivators is a very defective method. It leaves many blanks in the line. It leaves spaces in the line. For the present, in the absence of any other machine the Gujarát pattern of cotton seed drill should be introduced in the whole of the Southern Marátha Country. I have also suggested in the paper that the selection of seed should, as far as possible, be carefully observed. Systematic selection of seed is unknown in our parts. In America it is said to have been regularly practised, and many cotton varieties go by the names of individual cultivators. The very name of a cotton planter is a sufficient guarantee for the particular quality of his cotton. The pure seed that the gin-owners supply is, in fact, not a pure

seed; the seed of one type of cotton gets mixed with the seed of another type of cotton and is sold at any price that the ginowner fixes. If societies, such as I have already mentioned, come forward, the cultivators will get good seed at cheaper rates. With these few remarks I beg to leave my paper for the consideration of the Conference.

Mr. K. V. Joshi, B.Ag., Superintendent, Alibág Agricultural Station, observed as follows in presenting to the Conference his paper on 'Our work on rice—past and present':—Your Excellency, Sirdars and gentlemen, with a view to show you what the Agricultural Department has done—what useful work it has done—regarding the question of rice cultivation. I have submitted in my paper the results obtained so far, because they are of very great importance in a rice-producing country like ours. I have tried to show how far our results are applicable, in the present state of affairs, to the methods of growing rice in the Konkan. There are some substitutes suggested for 'ráb' material. Cow-dung is one such, but as it is found to be only 30 per cent. of the demand, we must have some other material in its stead. In many places we have not sufficient material for "TAHAL" also. The time has arrived when we must look to the question of trying to increase the supply of táhál. I have placed before you, in my paper, a scheme by which every village may have a supply of táhál. The next thing I have shown in the paper is how manuring can be done at the cheapest rate. The green-manuring process cannot be made equally applicable to all the districts in Konkan. In the southern districts of Konkan we will have to rely upon irrigation for producing green-manure but in the North Konkan it may be grown as kharif or rabi. I have placed before you other manures under trial for growing rice and have also mentioned the question of the number of seedlings to be used in the growing of rice.

Mr. H. V. Gole of Násik remarked as follows in presenting his paper to the Conference on 'Spraying of Plants':—Your Excellency and gentlemen, In my paper I have recorded my experiments for the last three years against the attacks of mildew. When you are growing grapes and you find that the vines are suffering from mildew, you may apply the spraying method, and expect to get a good crop.

Mr. W. W. Smart, B.A., I. C. S., Acting Director of Agriculture, addressed the Conference in the following terms while presenting his two papers:—Your Excellency, Sirdars and gentlemen, I have written two papers for this Conference—one on the subject of 'The organization of agriculture by the Department of Agriculture in Ireland and its application to the conditions of the Bombay Presidency,' and the other on 'The establishment of cotton markets in Egypt.' The first paper, I am afraid, will not be very popular in this assembly, but, gentlemen, I am glad to say that I have received a petition from, I believe, 250 cultivators of the Kalyán Táluka to support my suggestion. My proposal is to levy a cess of one pie on the land revenue of the district for the purpose of agricultural education and improvement. I wish to explain that I do not wish any compulsory taxation. I am against compulsion altogether. I do not wish any money to be subscribed in any district which is not subscribed willingly. I do not want to force upon anyone in this Presidency—especially the agriculturists—educational or other improvements, which they do not want. The whole point of the system I advocate is, that only those districts should levy a cess which are willing to do so and which really desire that improvements should be made in the direction I contemplate. For my second paper, I only wish to say that I am beholden to the Director of Agriculture in Egypt for sending me details of the management of cotton markets in Egypt. I have received several letters from persons attending this Conference, who have confirmed my remarks about malpractices in this Presidency. I may say what I have said before, that an enquiry was made by my Department on the whole subject, and there is no doubt that malpractices of many kinds do exist and that the cultivator is under a great disadvantage in marketing his cotton. Other gentlemen have written to me saying that they wish to support strongly the proposal and that Government should introduce some legislation on the subject. I have no more to say. With your Excellency's permission I present these two papers to the Conference.

Mr. Dube, who came from the Central Provinces, was introduced to the Conference by Mr. Smart and then made the following observations in presenting his paper to the Conference on the subject of "The system of seed distribution from the Akola Farm":—Your Excellency and gentlemen, everyone interested in agriculture here must know that seed selection is a great difficulty in agriculture. In order to distribute selected seed it is important that in each district you should select some persons and supply them with some selected seed every year. The quantity of seed available is multiplied rapidly by this means. Up to last year in the Central Provinces we were able to start above 90 seed farms. In March of this year we found the seed produced on the 90 cotton seed farms was not sufficient. The Agricultural Department had, therefore, to consult the Co-operative Department, and the Department decided to start Cotton Unions of 8 to 20 Cotton Growers who undertake to grow pure Rosea Cotton and no other. We employ a "Kámdár" to supervise the roguing out of other plants in the fields and to specially gin the cotton obtained. The seed which is grown at the Central Government Farm at Akola is supplied to the Unions and the seed subsequently produced by the members is stocked in one place for distribution in surrounding places. But at present Cotton Unions are new and there are only twenty-seven. To make the seed farms successful we have to make them popular among the cultivators.

The Honourable Mr. B. S. Kámat delivered the following speech while presenting to the Conference his paper on 'Agricultural Associations':—Your Excellency and gentlemen, with your Excellency's permission I shall make a few remarks in connection with my paper. I will address myself to two questions: the first is whether the Agricultural Associations have any scope for doing real useful work, and, secondly, if there is any scope, at all, what should be their constitution, so that they should be living bodies and not like some of these bodies now are? In answer to the first question, I may say there is plenty of scope if they are properly constituted, because, even with its ample machinery the staff of the Agricultural Department is not adequate to reach the cultivators and bring agricultural facilities to every cultivator's door. In answer to the second question, I can give you an outline of the present state of things and give you a brief review of things in other parts of India, *viz.*, Madras, Central Provinces, United Provinces and Bengal. Our Associations are at present suffering from three causes. (1) They are in the hands of men who are not actually undertaking agriculture but are theoretically interested and academically interested in agriculture. (2) The Associations do not work in close touch with the Agricultural Department. (3) People working in the Agricultural Associations are, in the majority of cases, merely desultorily interested. Having given these three weak points in the life of the Associations, I may tell you that the present difficulties under which they are labouring are (1) the lack of staff and (2) the lack of funds. To get over these difficulties I would suggest two remedies, *viz.*, Self-help and Co-operation. I would suggest that the Agricultural Department should co-operate with these associations, who should work on the principle that the Department should give help to those that help themselves. The promoters of these associations should start small funds with which to purchase seed and implements, and lease plots of lands from members and pay the clerks' salaries. With these things assured, they should seek the co-operation of the Agricultural Department. I would ask that such associations should be recognised by the Agricultural Department. That Department should nominate one or two senior officers to work in consultation with their managing committees. The Collector should be the *ex-officio* President of the Association and nominate a certain number of landholders, as is the case in the Central Provinces, to work as non-official members. The Chairman of the managing committee should be a non-official gentleman. With such guidance and such co-operation from the Agricultural Department, I have every hope that the Agricultural Department will be able to make these associations do useful work, such as providing Demonstration Farms and serving as implement selling and seed-growing agencies. I would further suggest that in the case of deserving agriculturists, we should ask Government to help them with small grants for the purpose of working out certain definite schemes, subject to the supervision of and in consultation with the officers of the Agricultural Department.

ment. When able to carry on useful work under the auspices of the Agricultural Department, the Agricultural Associations are sure to play a not insignificant part in the organisation of agriculture.

Mr. T. B. Kotwal, B.A., LL.B., Sub-Judge, Haveli, said as follows in presenting to the Conference his paper on 'Industries Subsidiary to Agriculture':—Gentlemen, I have referred, in my paper, to Buludars as agriculturists and following some subsidiary industry. The example of Russia shows that carpentry, weaving, the production of improved agricultural implements and machinery, fur-dressing industry, leather industry, and lace industry, can profitably occupy the peasants there. I submit an extract on the subject from 'Commerce and Co-operation.' Some of the Buludars can very well imitate the Russian peasants, notably the carpenter, the blacksmith, the Mahár, the shoemaker, the Máng and some others. In this connection I find Mr. G. V. Desai's speech in the last Conference, on page 27, to be very suggestive. He says:—'I would suggest the introduction of one useful element at these Demonstrations. It is that of the artisans. As at such places people of all sorts gather, the artisan class will surely attend. Thus, along with the necessary instructions, theoretical, of course, regarding the use of implements, including water-lifts and pumps, that are proposed to be given to cultivators, it is equally important to utilise the attendance of artisans by way of showing them how and where the articles are manufactured and how they can be fitted up, regulated and repaired. These artisans can try themselves and also find out if it is possible for them to manufacture any parts of the article locally. I mean Demonstrations of this sort can impart profitable knowledge and create no small amount of useful interest.' If the Buludars are trained at the workshop, to be opened at the Agricultural College, a way will be found to make old bottles hold new wine. The indigenous agency will be fitted up for new conditions.

On the question of cattle breeding and dairy farming, the papers of Dr. Mann, Mr. Horn and Mr. Mountford will throw great light. The speech of the Honourable Sir John Muir Mackenzie, in the last Conference (page 18), shows the necessity, importance and ways of doing it.

Mr. Brander's views about the effect of irrigation on the demand for labour are the same as those I have expressed in my paper (page 39, last Conference). Mr. Patwardhan's paper also refers to this aspect.

Mr. Gharat's speech (page 12) suggests to me a question whether tapioca would be made more paying than the 'harik' crop, which is nearly 35 per cent. of the tillage area in the Ratnágiri District.

The necessity of planting trees seems to be supported at page 58 in the speech of the Honourable Sir John Muir Mackenzie.

A discussion of the subsidiary industries is on pages 48—50, and casual reference to ericulture and sericulture and some home industries on pages 3, 28, 30 and 50. A decided favourable opinion has been given in favour of ericulture and poultry breeding, cattle breeding and bee-keeping were also mentioned. Other possible industries mentioned are seed business and the manufacture and repair of the parts of foreign implements recommended by the Agricultural Department.

The aspect of dispensing with middlemen and encouraging agriculturists to sell their own produce or purchase that of others and sell it, is referred to at pages 35 and 37 of the Report of the last Conference. I quote the remarks: "Ryots can seldom manage to dispense of their own cotton and jaggery direct to merchants; they must have a middleman and this 'daughter of the horse leech' is ever grasping at more and more of the profits of trade." I have shown how this can be remedied.

The necessity of the help of well-off persons and Local Boards for all aspects of agricultural improvements and the material improvement of the agriculturists is referred to at pages 4, 25, 29, 32, 33 and 60. Mr. Smart's paper specially asks for legislative powers for the Local Boards to levy a Local

Cess for these purposes. When the funds are available, subsidiary industries will come in for a share of money thus raised. These remarks support my view for pecuniary help for the spread of subsidiary industries.

Mr. Patwardhan's paper supports my views about canning fruit and vegetables, etc.

The question of edible mushrooms is indirectly cleared up by the papers of Messrs. Gole and Ajrekar, who write about fungoid diseases. The Mycologist will make it his province to create an industry of edible mushrooms in suitable places, which are numerous, according to the views of Mr. MacRae. We can expect our Agricultural Graduates to introduce this industry, who specialize in Mycology, and other seedsmen of the future must co-operate with the Graduate-Mycologists. (See page 25 of the Report of the last Conference.)

I have made these stray remarks to show how light is thrown on my paper by the work done in the last Conference and by the papers presented to this Conference.

With these observations I submit for the consideration of this Conference that the Department be asked:—

(1) To prepare an exhaustive list of the bibliography on the subject of the Industries Subsidiary to Agriculture.

(2) To collect data for recommending suitable subsidiary industries to different localities, where they are needed or can be usefully pursued, and to recommend the same.

(3) To consider whether certain classes of the Buludars be trained at the workshop to be opened at the Agricultural College.

(4) To enlist the sympathy of the staff of the Department to spread a knowledge of suitable subsidiary industries in the villages.

(5) To help and supplement the work of Agricultural Associations in this branch of work.

(6) To provide mother-lac, spawns, eggs of tortoises, eggs or chickens of recommended poultry, eggs of eri silk worms, cuttings of tapiocas, shingada creepers, facilities for learning canning of fruit and vegetables, instruction in fish culture, and to provide eggs of fish.

Mr. L. J. Mountford, I. C. S., Collector of Poona, made the following remarks in presenting his paper on 'A (Kadbi) Fodder Co-operative Society' to the Conference:—Your Excellency and gentlemen, a great deal of our land, which used to be put under 'jowári,' is now put under groundnut with the improved foreign seed, which we have introduced. The agriculturists will go on growing groundnut, so long as they can get a good market—a better market than for 'Jowári' and 'Kadbi.' In the note that I have prepared, you will see I have stated that it is quite possible for any man to make a very handsome profit on his 'Jowári' and on his 'Kadbi' so long as the kadbi is properly looked after and preserved. 'Kadbi' in ordinary years rises in value from Rs. 8 per 1,000 pounds to Rs. 13-14-0. But the cultivators cannot store it on account of the fear of fire and theft. In one village I was told there were three fires within three weeks. The Societies I have suggested are really for receiving, preserving, safeguarding and afterwards selling 'Kadbi' in villages at the ordinary rise in prices, which is sure to ensue during the year. When the ryot knows he can make more money from 'Kadbi' and from 'Jowári' than at present, the increase in the cultivation of groundnut will be checked. To what extent groundnut is raised to the prejudice of 'Jowári,' may be gauged from the fact that in the Sátára District there is an increase of land under groundnut from 28,000 to 92,000 acres, while there is a decrease of land put under 'Jowári' from 5 lákhs to 4 lákhs acres. Therefore, I would like someone to take a deep interest in this matter of establishing the kind of Societies which I have proposed. I have received information that two such Societies are being started. I am sure, when they are successful there will be a fall in the price of 'Jowári'

and also the rate of food-grains will be cheaper. I must apologise for a long speech on the short note which I have presented.

Dr. Harold Mann, Principal, Agricultural College, read the following telegram received from the Reddis, a small community in the Dhárwár District :—

“Wish Conference every success. Interest of Rs. 3,000 from the Raddi Education Fund will be devoted to the furtherance of agricultural education by means of scholarships to the Devi-Hosur School.”

His Excellency then rose to leave the Conference but before leaving, a vote of thanks to His Excellency was proposed and seconded.

The Hon'ble Sardár Cooposwamy Moodliár, in proposing the vote of thanks said :—Your Excellency and gentlemen,—I have great pleasure in proposing a hearty vote of thanks to Your Excellency for presiding on this occasion, in spite of Your Excellency having much more important engagements elsewhere. We are all sanguine that Your Excellency will take interest in agriculture in this Presidency, as long as Your Excellency is in India. It is a matter for sincere gratification that Your Excellency takes such an earnest interest in the improvement of agriculture in India. I again beg to propose a hearty vote of thanks to Your Excellency on behalf of the Conference. (Cheers.)

The Hon'ble Mr. B. S. Kámat :—Your Excellency and gentlemen,—I feel very great pleasure in seconding the vote of thanks which was so enthusiastically proposed to Your Excellency by the Hon'ble Sardár Ráo Bahádúr Cooposwamy Moodliár. Our thanks are due to Your Excellency for the living, generous and real personal interest which Your Excellency takes as regards the agricultural and horticultural industries in this country. (Cheers.)

His Excellency Lord Willingdon, the Governor, in acknowledging the vote of thanks observed as follows :—Sir Richard Lamb and gentlemen,—I am extremely obliged to you for the kind remarks I have just listened to. I would have waited to listen to the terms of your resolutions, but I regret extremely that other duties call me away. This afternoon I shall not be here, as I have to go to Bombay. I have listened with great interest to the preliminary remarks on various papers. I think they give you subjects for an interesting discussion, and I hope that you will come to some practical decision on many of the points that have been raised. Let me tell you quite sincerely, it seems to me, as the head of the Administration, that it is your duty to give us advice on the great question of agriculture, and if we are convinced that your advice is absolutely sound and absolutely correct, then it is our duty to move in the matter. As far as I can see, a great many years will elapse before the question of agriculture is completely solved, but I will do anything I possibly can, while I am here, to help forward your interests in agriculture. I am delighted to meet you and I hope I may have opportunities of touring in various parts of the Presidency and renewing the acquaintance with you which has happily begun this morning. (Hear, hear.) I ought to have said that I ask Sir Richard Lamb to take my place, and I hope under his presidency you will do very much better work. (Loud applause.)

His Excellency then left and the Hon'ble Sir Richard Lamb took the chair.

QUESTIONS AND COMMENTS ARISING OUT OF THE REVIEW OF THE PROGRESS OF THE DEPARTMENT SINCE THE LAST CONFERENCE.

Questions dealt with by the Director of Agriculture.

Mr. W. W. Smart, Acting Director, dealt with the following :—

Mr. B. V. Padbidri, Mámlatdár of Gadag and President of the Kurtkotí Agricultural Association, wished to know (1) whether lectures could not be given to ryots by Divisional Inspectors and District Overseers as to crops which should be sown, just before sowing; (2) whether greater publicity could not be given to demonstrations; (3) whether a leaflet on the feeding of prickly-pear could not be distributed.

In reply Mr. Smart stated that lectures and demonstrations are given by the Officers referred to in villages, but they could not arrange to give such lectures just before sowing. Arrangements were being made for these officers to attend meetings of Associations, and time did not admit of more.

As to (2), demonstrations are held generally in consultation with Mámlat-dárs and District Officers. All Officers of the Department will be reminded again to give ample notice of demonstrations.

As to (3), a leaflet on the feeding of prickly-pear will be issued shortly.

Mr. G. A. Hiremath, L.Ag., District Deputy Collector, E. D., West Khándesh, asked certain questions as to fodder. He wished to know whether there was any information as to the proportion in which the following three factors in the relief of distress caused by fodder famines stood in any famine year in any one district, namely, (1) storing, (2) growing, (3) importing fodder.

Mr. Smart stated that figures of the area under fodder crops are available, and that it would be safe to say that fodder is seldom stored from one season to another, and that figures as to the importation of grass by rail would be available.

Mr. Hiremath drew a distinction between "Sundhia" and similar jowáris which are cut unripe and the stalks of jowáris, the grain of which is harvested. The former be termed "Kachha fodder" and the latter "Kadbi". He was informed by Mr. Smart in answer to his questions, that "Kachha fodder" could be dried, and it was fed to bullocks in hard work and to milch cattle in Gujarát with profit, but irrigation was necessary; an outturn of 20,000 lbs. per acre, which could be sold at from Rs. 8 to Rs. 10 per 1,000 lbs. could be expected. If ordinary jowári were grown and "Kadbi" used as fodder, then 500 to 1,000 lbs. of grain, and from 1,500 to 3,000 lbs. of "Kadbi" could be obtained per acre.

"Kachha fodder" is nutritive and profitable to grow; it can be stored but not transported by rail with profit, unless perhaps it be pressed into highly compressed bales.

Mr. Hiremath received the following reply to his questions as to Agricultural Associations :—

The objects of Agricultural Associations are entered in their bye-laws. The Agricultural Department help Associations by lending officers to assist in the organisation of shows, to which the Department contributes. Officers of the Department give demonstrations, supply exhibits and deliver lectures at shows. Agricultural literature is supplied by the Department to Associations and has been supplied for distribution.

There has been no overlapping of work by the Department and Associations, because the latter have confined themselves almost entirely to giving shows and demonstrations. The distribution of seed and implements by the Department is carried out through Associations, whenever the latter can be induced to undertake such work.

Some village associations exist, and Shri Mahabhagwat of Kurtkoti has written a paper on the subject, which has been presented to the Conference. A few Co-operative Societies have taken up the distribution of seed, but it is too early to say whether they can be used extensively to further agricultural improvement. The appointment of an officer whose sole business would be to visit agricultural associations and advise members, in the same way as Auditors visited Co-operative Societies would not be advisable. The Divisional Inspectors were the only officers who possessed the requisite experience and local knowledge, and they could and did perform this work. The appointment of Mr. Kogekar by the Deccan Agricultural Association to visit Associations in the Deccan was a special case and resulted in benefiting them. It would not be possible or desirable that the Department should appoint a special officer for each division to do work which could be done better by Divisional Inspectors and their staff.

Mr. L. S. Potnis, Mámíatdár of Kalvan, asked whether improved implements could not be kept and distributed free for the use of agriculturists from Táluka Local Board Offices.

In reply Mr. Smart stated that such free distribution had been tried by the department and had failed. What is not paid for, is considered worthless, and the implements were not used and were neglected. If Táluka Local Boards possess the necessary supervising staff, implements might be let out on hire.

Mr. Potnis asked whether handbooks could be written in vernacular on crop pests, dairying and the sowing, growing and harvesting of crops, and was informed that a pamphlet on crop pests was in course of preparation; that a bulletin on how to start and manage a dairy had been issued by the department and that a Maráthi book on the subject by Mr. Ghare had been published in Bombay. Cultivators know well enough the ordinary details of sowing and harvesting staple crops and leaflets were issued as to new methods or crops which were unknown to them.

Mr. B. N. Rájadnya of Aitwade Khurd, Sátára District, asked whether standard weights and measures could not be introduced throughout India. Mr. Smart stated that a Commission to inquire into this subject was, he understood, to be appointed shortly and the Hon'ble Mr. Arthur might be able to give more information on the subject.

The Hon'ble Mr. Arthur signified that he had no information.

Mr. Rájadnya complained of the scarcity of farm-yard manure and asked whether Sanitary Committees could not make poudrette. Mr. Smart stated that the making of proper poudrette was expensive and required a large staff, and was insanitary unless supervised adequately. In Násik the Municipality turned night-soil into a manure almost equal in manurial value to poudrette, by digging deep trenches and covering successive layers with a thin coat of town-sweepings. This method was cheap and sanitary, and Mr. Smart promised to issue a leaflet on the subject.

Mr. Rájadnya enquired whether in the drier parts of the Deccan Government would forego the revenue derived from the planting of teak trees in occupied lands, as the present rules discouraged the planting of good trees in a treeless tract. Mr. Smart replied that the matter was one for the Revenue Department to decide and presumably the revenue now derived from this source as well as other considerations, must be taken into account.

Sardár Motilál Chunilál asked whether information as to the use of copper sulphate as a preventive of smut on jowári in Gujarát, could be distributed widely, and suggested that Agricultural Associations should be asked to encourage its use. In reply Mr. Smart remarked that smut was almost universal and that it was proposed by the department to issue packets of copper sulphate with directions how to use it printed on the wrapper in vernacular similar to the quinine packets obtainable at post offices, and that Agricultural Associations would be asked to distribute them.

Sardár P. K. Biwalkar asked that an agricultural survey of each district should be undertaken, and was informed that the question had been considered.

Mr. Smart said that he considered a survey to be desirable, but a special staff must be appointed temporarily to carry it out.

Sardár Biwalkar asked whether the Educational Department could not be requested to make liberal grants towards Agricultural Schools as the Educational Department had declined to undertake Agricultural Education.

Mr. Smart stated that the amount spent from the budget of the Agricultural Department on education was very large, and that he would be very glad to get a grant from the Educational Department towards Agricultural schools.

To Sardár Biwalkar's suggestion that a full-time Registrar and one or two paid organisers should be appointed to start Co-operative Societies for agricultural purposes, Mr. Smart replied that the policy of the Bombay Government

had been to discourage official organisation of Societies, and to leave such work to unofficial agency, and that in his opinion to create societies by official pressure would be fatal to the movement.

Questions dealt with by the Agricultural Chemist.

Dr. H. H. Mann, Agricultural Chemist, gave the following answers to questions :—

Mr. P. M. Biládikar of East Khándesh asked whether a High Class Magazine in *Maráthi*, more or less of the standard of the Agricultural College Magazine could not be published.

Reply.—If I get assurance of sufficient support to make the issue of such a *Maráthi* Magazine paying, I shall be glad to arrange for the issue. The “*Shetki and Shetkari*” has proved in its present form that it meets a real need, and I do not want to change its character materially.

Mr. Rájadnya asked :—What was the value of Mhowra Refuse for manure ?

Reply.—If farm-yard manure can be obtained at 12 annas per cart-load, it would certainly *not* pay to buy Mhowra Refuse at Rs. 3 per load. Its relative value would not be above Rs. 1-8-0.

What was the value of groundnut husk as manure ?

Reply.—Groundnut husks are not worth Re. 1 per cart-load, if farm-yard manure is obtainable at 12 annas per cart-load. The relative value of groundnut husks will not be greater than 8 annas at the most.

Is the preparation of *Khava* from separated milk possible ?

Reply.—*Khava* can be made equally well from separated milk as from whole milk.

Questions dealt with by the Superintendent, Civil Veterinary Department, Bombay Presidency, Poona.

Lt.-Col. H. M. Maxwell, Superintendent, Civil Veterinary Department, replied to *Mr. D. N. Desai* of Kharsád, district Surat, as follows :—

1. The veterinary education at present given to farmers by this Department consists of the following :

(a) Practical demonstrations by all Veterinary Assistants both at their dispensaries and when on tour.

(b) Lectures given by Inspectors and Veterinary Assistants at shows and fairs.

(c) The circulation of leaflets in the Vernacular on the more common affections of animals and the contagious diseases, chiefly met with.

To *Mr. L. S. Potnis'* questions as to the strength of the Department, as follows :—

The strength of the Subordinate Civil Veterinary Department sanctioned by the Secretary of State is one Deputy Superintendent for each division, one Inspector for each district, and one Veterinary Assistant for each *táluka*. The first step to this end had been an endeavour to open 3 dispensaries in each district and this has been fully attained in the Central Division and nearly so in the other two divisions. It will take some years yet to work up to the full strength sanctioned chiefly for two reasons—

(a) Want of Funds by the District Boards.

(b) Difficulty in obtaining good graduates owing to the low pay offered to them.

To Mr. Potnis' question as to how green flies and mosquitoes can be kept away from cattle, while grazing,

Colonel Maxwell replied :—Many applications can be made to keep off these parasites of cattle, but as their effect is only temporary no treatment that I know of is of any practical value.

Questions dealt with by the Professor of Agriculture.

In reply to question by Mr. A. K. Deshpande :—The experiments carried on by me at Lonávla during the last ten years have definitely settled that heat is an important part of ráb, but just how it acts remains still to be clearly worked out; but undoubtedly it is through the living organisms of the soil.

Several other things have been proved to be as useful as ráb for seed-bed treatments in raising rice seedlings. But the economy of their use depends upon the price at which they can be obtained and the cost of rabin; if the labour of fetching ráb materials and preparing them is charged for at current rates undoubtedly several treatments are cheaper. The most useful are oilcakes such as niger, Karanja and Rayan. Household ashes used with fish manure, poudrette, well rotten farm-yard manure and cattle urine are useful. Of Chemicals sulphate of Ammonia and any of the Nitrates are useful. I hope to issue a Bulletin soon explaining the use of these.

Questions dealt with by the Economic Botanist.

Mr. W. Burns, Economic Botanist, dealt with the questions referred to him as follows :—

Mr. L. S. Potnis, Mámlatdár, Kalvan, asked :—

1. Is there any other way except cutting to remove the parasites, Bandgul or Bandha, on mango trees? Does the seed of these parasites spread with the wind and affect the neighbouring mango trees?

Reply.—There is no other way of removing the parasites except cutting. The cutting should, however, be done at as early a stage of the parasite as possible and a sharp look-out should be kept for fresh infections. The seeds are spread not by the wind but by birds, and neighbouring trees are thus affected.

2. Is it possible to make plantations of good grass like 'marvel,' 'pavana,' 'hariáli,' or 'shevra,' on waste lands, banks of rivers and nálas, intermediate surbands, and bands between fields and the slopes of hills? If possible, what steps should be taken to remove the present varieties of grass like 'ganjni' and 'kusli' and introduce new ones?

Reply.—It is possible to make plantations of good grass in the positions named. The steps to be taken are, first, the collection of ripe seed of the desired grasses in quantity; the second is the removal of the grasses already occupying the area. The collection of the grass seed is a matter that a private person can easily arrange with two or three properly supervised coolies. The removal of the grasses already on the positions is a difficult matter. Deep digging and uprooting and burning of the grasses, before they seed, is needed. Even then it will take more than one sowing to establish the new grass. In Ganeshkhind Garden and at the College and Mánjri farms experiments with such grasses have been made, and Mr. Potnis will see the results of these on his visits to these places.

Mr. P. M. Biládikar asked :—

Though spraying has been recommended as the most effective remedy to save crops from 'Mawa,' I think that it is not yet tried on a large scale except on grapes. For the last three years I have been observing that 'mug,' 'chavli,' and most of 'Udid' are eaten up by 'Mawa.' They are the principal products that serve the purpose of vegetables and 'dál' for the poor cultivators. In my own village I know that 'mug,' 'chavli' and part of 'Udid' are destroyed by 'Mawa' this year. Secondly, 'jowár' is the principal product of food in this part and it is often attacked by 'tahuli.' As the area under this crop is also greater, the loss on account of 'tahuli' is also greater, and the poor cultivator

has simply to weep over the crop which he reared and was destroyed by diseases. I, therefore, beg to suggest that information from one district, at least, regard the loss of 'mug,' 'chavli,' and 'Udid' by 'Mawa' and of 'jowár' by 'tahuli' be collected this year, and a village, at least, from a táluka or a group of tálukás be taken for experiment to destroy 'Mawa' and 'tahuli.'

Reply.—It is too late this year to do anything. Next year we may be able to start the collection of information. As regards the spraying campaign, it may not be possible to take it up on a large scale till our two present spraying campaigns on grapes and supári are completed, but the matter will receive as early attention as possible. As to the tahuli disease of jowár, it is already under investigation by a worker in the Botanical Department, and after we understand the way it forms its connection with the jowár plant, we shall at once devise field remedies, which will be tried first on a small scale and afterwards, if successful, on a large scale.

Mr. S. G. Páregaonkar, Sangamner, asked :—

1. Has anyone from the Kánara District applied to Government for suitable concessions and help for the rubber cultivation, as has been suggested by the President of the Agricultural Conference in the year 1906? If applied for, what concessions and help was given?

Reply.—I am not in a position to say whether concessions have been applied for or not. A considerable number of enquiries regarding rubber cultivation have been dealt with by me and seed given when asked for. The question of rubber concessions is in the hands of the Revenue Department.

2. In a note on experimental rubber cultivation, Professor Gammie has stated that in the year 1907 seeds of Ceara rubber have been distributed to many districts, and in two or three years we may be able to give a more definite report. Is the report published? Can you recommend its plantation in the Ahmednagar District? Kindly give a short account of your experiments and results? What measures are you going to adopt to encourage its plantation in the Deccan?

Reply.—Reports were received only from Broach and Bijápur. In both cases the seeds failed to germinate. I most certainly do *not* recommend the plantation of any kind of rubber in the Ahmednagar District. As to a short account of the experiments and results: in neither Poona nor Bassein did the Ceara do well. The tree suffers both from water-lodging and from dry hot weather. It is, moreover, very easily broken by wind and the yield of rubber is small. It does not recover easily from tapping. No measures will be taken to encourage its plantation in the Deccan, as it is unsuited to that area.

3. Experiments were in progress (1906) with the introduction of new varieties of grapes in the hope that they might prove disease-resisting. Can you recommend any new variety of disease-resisting type?

Reply.—The reply is in the negative.

4. Conditions of the fruit and vegetable trade between various centres and Bombay were under investigation in 1907. Is the Department in a position to recommend definite measures that can be safely followed in establishing closer relation between producers and wholesale dealers?

Reply.—The matter is touched on in page 6 of the paper on Horticultural Possibilities of Western India, presented to this Conference by Mr. G. B. Patwardhan. Beyond that the Department has nothing more to say at present.

*Questions dealt with by the Deputy Director of Agriculture,
Southern Division.*

Mr. T. Gilbert, Acting Deputy Director of Agriculture, Southern Division, dealt with the following questions put by Mr. Padbidri, Mámlatdár, Gadag :—

(1) Green manuring and Ammonium sulphate for jowári in Southern Division.

“Green manuring is impracticable, as the growing season is as a rule too short to allow of the cultivation of two successive crops in a single year on dry crop land.”

“The results of experiments carried out on the Dhárwár Farm tend to show that Ammonium Sulphate cannot be applied economically to dry crop jowari.”

(2) Soybean in Southern Maratha Country.

“Several varieties of soybean are under trial on the Dhárwár and Gokak Canal Farms, but have not been as yet successful.”

Questions dealt with by the Agricultural Engineer.

Mr. W. Schutte, Agricultural Engineer, dealt with the following question :—

Mr. Rájadnya of Aitwade Khurd, Sátára District, stated that the Sanitary Department had a grant of Rs. 60,000 for well-boring and asked whether the Agricultural Department which appeared to possess no staff for the purpose, could not co-operate with the Sanitary Department.

Mr. Schutte, replied as follows :—

The Sanitary Department has a grant of Rs. 60,000 for boring wells, which are principally for drinking purposes.

The Agricultural Department has a special grant for boring which is principally for irrigation purposes. It is in possession of 31 boring machines and is doing boring on an extensive scale in Gujarát. It has also taken up boring in the Deccan with a new machine suitable for rock boring.

This machine is available for boring in any part of the Presidency. A special staff is engaged for this purpose.

Judging from this I see no need for co-operation on the lines suggested, because each department has its own staff and expert, and is at the same time fully occupied.

Torpedoing is being taken up in earnest now and a special staff is being trained and will shortly be quite efficient for blasting under my supervision.

Questions dealt with by the Extra Deputy Director of Agriculture, Konkan.

Mr. V. H. Gonehalli, M.A. (Cantab.) :—Extra Deputy Director of Agriculture, Konkan, replied to certain questions as follows :—

(Reply to Rao Saheb P. N. Pandit.)

Mr. Chairman and gentlemen, in answering the questions asked by gentlemen coming from Kokan I want the conference to note that Rao Saheb P. N. Pandit has raised the very important question of duty-free salt for agricultural purposes in the four districts in my division. I am glad to say that the department have given their best attention to it. After I took up my appointment as Divisional Inspector in 1910, Mr. Keatinge asked me to report on the question. There are two issues which should be solved in tackling the problem. First, the department has to find out a method of denaturalizing or making unfit for human consumption salt issued for manure, as we were told that salt is beneficial as manure. Cowdung was suggested as the material to be mixed with salt. This year we have been able to suggest a very efficient method of denaturalizing salt. This method is to mix salt with 5 per cent. bone dust and 1 per cent. fuel oil. The denaturalised material stinks so much that no one, whether high-caste or low-caste, rich or poor, is likely to use it as such for eating purposes. In some quarters it is apprehended that the low-caste people will eat the denaturalised salt. But I take the liberty of pointing out that none would like to eat it, because of its horrible, offensive smell.

It is also hinted that the people would make a solution of the denaturalised material, evaporate it and then eat the recovered salt. In this respect, I would point out that the cost of fuel alone would effectually prevent any attempt at

manufacturing salt illicitly. In the two tests carried out at the Ratnágiri Farm, for recovering 10 pounds of salt, which could be bought in the bazaar for $3\frac{1}{2}$ annas, even at the rate of price of duty-paid salt, the average cost of fuel alone was 5 annas. Besides, there was labour, which had to be paid for.

I have already submitted to the Director a full report on the question that salt denaturalised with bone dust and fuel oil should be issued to selected cultivators at 10 annas per maund. I am sure that this proposal will receive all due consideration at the hands of the Director and Government.

(Reply to Mr. S. N. Keshawain.)

Coming to the question raised by Mr. S. N. Keshawain, Secretary, Sirsi Táluka Agricultural Association, I wish to state for the information of the gentlemen from Kánara that I have already reported to the Director on the necessity of an experimental station in that district. I have brought to the notice of my Chief the several problems which stand in need of investigation, such as the utilisation of fish and other manures for sugarcane, the introduction of superior varieties of cane; the methods of green manuring the rice crop; the transplanting of a few seedlings in each hole instead of many, as is the local practice; the question of substituting soppu for green leaves from forests; the maintaining and improving of the fertility of spice gardens of the above ghát tálukas, and so on. The budget estimates also have been submitted to the Director. I am sure that my proposals will be duly considered by the Director and Government at the proper time.

(Reply to Ráo Sáheb Ganpatráo Másur.)

(A) Now I deal with the questions raised by my friend Ráo Sáheb Ganpatráo Másur. As regards tillage experiments suggested by him, I would point out that one experiment was carried out last year at the Alibág Farm to test the utility of ploughing rice fields in the hot season which is not done in the North Konkan. The increase in the outturn of paddy due to ploughing in the hot season was 208 pounds of grain per acre.

In the matter of seed selection, the Japanese method of selecting paddy seed in a solution of salt and water has been tried. As regards results I would state that the seed selected by the Japanese method gave an increase in the outturn of 136 pounds per acre.

The other method of selecting paddy seed by plant to plant selection is under experiment, and the results will be available in the course of the next few years.

(B) Regarding Ráo Sáheb Másur's question about milch cattle suitable for the coast tálukas of Kánara, I would bring to his notice that buffalo is the milk-animal of India, and as such is suited to the conditions of the maritime tálukas. But so far as cows are concerned, I have seen the Kochin cows at Honáwar, which were shown to me last year by my friend Mr. Raghwendrao Basur and which are reputed to be good milkers. I also know that Sindhi cows are well known for their milking capacity. When our work in Kánara expands and we have a station there, it would certainly be worthwhile for the department to get some Sindhi and Kochin cows and test their milking capacity and their suitability for the coast tálukas.

(C) Referring to Ráo Sáheb Másur's question on secondary occupations, I would state that only eri silk culture has been tried, but without any great success heretofore.

(Reply to Mr. V. B. Parulekar.)

1. I now come to the questions raised by Mr. V. B. Parulekar, Mámílatdár, Mahád. His first question is as regards the desirability of starting a co-operative rice straw society somewhere in the Konkan on the lines of the kadbí societies proposed to be organised by Mr. Mountford, the Collector of Poona, in his district. In the Konkan, we are only just starting the co-operative movement, and in the Kolába District there are only a few societies in existence. When the co-operative movement has made some progress and a good number

of Credit Societies have been started, we should certainly extend the movement to the different branches of the business of agriculture. The suggestion made by Mr. Parulekar will meanwhile receive careful consideration, and when I visit Mahád next time, I will enquire into the fodder question on the spot.

In Konkan we never have any fodder famine as in the ghát districts. But it is well known that cattle are underfed. During the seven months of the year—from January to July—they do not get sufficient food. Grass is not cut at the proper time and is allowed to seed. Silage-making is unknown. But an experiment carried out last year at the Alibág Farm in silage-making was successful.

There is one source of wastage of rice straw which is the principal fodder in Konkan. A large quantity, which should go to feed the cattle, is used for thatching houses. The people say that they are not rich enough to have tiled houses. But I have found in certain villages of the Máhim Táluka, in the Thána District, that most of the cultivators use country tiles for roofing instead of rice straw. The danger from fire to houses thatched with rice straw is considerable. I wish to suggest to the Conference that gentlemen interested in the question of fodder should try to devise a scheme by which the poorer cultivators can be financed to tile their houses.

2. *Fodder crops.*—As regards Mr. Parulekar's second question, I would state to the Conference that lucerne is cultivated with great success at certain places in the Thána District. Wherever irrigation is available lucerne should be cultivated. There is maize which also grows well under irrigation. At Pen Mr. Kundráo Tilak's cattle, which are fed on green maize fodder, grown as a subsidiary crop with potato on rice lands in the rabi season, are invariably better than the cattle of his neighbours, which get no green fodder in the hot season. Guinea grass, which has been tried with success in the Konkan, requires irrigation.

Last year's experiments show that Belgaum jowár and Imphee Sorghum grow well on varkas lands in the kharif season. This year on the Bandhan sub-station, these crops have been growing well side by side with groundnut. A demonstration will be given at the end of this month, and the Collector of Kolába has promised support. Parties of cultivators from different tálukas of Thána and Kolába will be brought to the Bandhan sub-station to see the standing crops.

(Reply to Mr. G. M. Kámat.)

Now coming to the interesting paper submitted by Mr. Kámat, Secretary, Kolába District Agricultural Association, I would say that the question of green manuring is under investigation.

Touching on the question of cattle, I would point out that the number of cattle has been increasing for several years past in the Kolába District. The question of improving the fodder-supply by cutting grass at the proper time and turning into silage or hay is important, and the experiment carried out last year at the Alibág Farm in silage-making was pretty successful. The most important question, however, which Mr. Kámat has raised is that of irrigation in Konkan. It is generally held that in a very heavy rainfall-tract like Konkan, no special irrigation works are necessary; the disappearance of 'talaos' or tanks, whose beds have been turned into rice lands to the great detriment of the crops of neighbouring fields is very deplorable. The issues for consideration, as they arise from Mr. Kámat's paper, are two :—

1. The construction of tanks, which will irrigate rice fields during a period of drought—this is for irrigation in the monsoon.
2. The damming of streams and nálas, for storing water higher up and utilising it for growing valuable crops in the fair season.

Regarding the first issue, I would suggest that the land-owners, who have converted the tanks into rice-fields, should reconvert them into tanks. But as regards the second issue, I would cite the instance of the famous Dhámapur Tank, in the Ratnágiri District, which irrigates over a hundred acres of land

in the fair season. This tank has been made by putting a dam, 450 feet long, across the ravine between the two hills, which run parallel, at a point where they converge. The Dhámapur Tank is a model; and the question is whether in a thickly-populated district like the Ratnágiri District, where land is scarce, suitable village water-works could be constructed to enable the ryots to grow hot weather crops under irrigation. The subject is very important, and I have already started an enquiry into it. The department hopes to have something definite to lay before the next Conference.

(Reply to Mr. S. D. Navalkar.)

Regarding Mr. Navalkar's enquiry, I am thankful to him for the suggestions he has made and with which I absolutely agree. One of the factors governing the fertility of rice-fields is the breadth and condition of bandhs. In certain parts of Kolába District, wide bandhs are kept in good condition. I know land-owners like Mr. Kámat, Secretary, Kolába District Agricultural Association, Sirdar P. K. Biwalkar and others, who take particular care of the bandhs of their rice-fields. But the condition of the bandhs in the Southern Konkan is deplorable. The department has already moved in this matter and begun investigations. The results of the experiments carried out with the object of ascertaining what crops are best suited for cultivation on bandhs show that tur, ghewda and imphee sorghum grow well on the bandhs of rice-fields. Referring to the suggestion made by my friend Mr. Navalkar of Dinánath Khar, I will take steps to have chaoli (*Dolichos catiang*) tried as a bandh crop at the experimental stations in Konkan.

Questions dealt with by the Extra Deputy Director of Agriculture,
Bombay Presidency, Poona.

Ráo Sáheb Kelkar gave the following replies to the questions addressed to him:—

(1) Mr. Páregaonkar of Sangamner, asked:—Is the curing house for tobacco now built? Can you give some account of the use made of it?

Yes. The results obtained in the curing house at Nadiad are encouraging. The colour of the cured leaf is good, but the leaf does not burn well. It is deficient in Potash.

(2) Mr. L. S. Potnis, Mámlatdár of Kalvan, asked:—Whether Broach Cotton can be tried next year in the West Kalvan?

It is no use trying Broach Cotton in places where soil and climatic conditions differ a good deal from its original home. Most likely it will suffer for want of moisture at the later stage. It is also likely to suffer from severe cold.

(3) Whether the cultivation of Kamod rice under *Pátasthal* can be improved?

Yes. By raising seedlings by using well-rotted manure for seed beds and then transplanting the seedlings in the green manured field.

(4) (a) Can good seed of lucerne be supplied?

Yes; on application for seed to the department.

(b) Was the seed previously obtained by cultivators defective?

Yes. It must be Quetta seed.

(5) Are there early varieties of bájri and kulthi?

There is no special early variety of Bájri.

There are three varieties of kulthi—black, mottled, and white—of which black is the earliest. The seed can be seen on the College Farm.

(6) Mr. R. N. Rájadnya of Aitawde, asked:—Do you know whether पोसाचा दंग is used for pounding Khapli wheat? Have you compared the work of Ghani and Dang in pounding?

I know the Dang. Comparative trials will be made.

7. How the iron mhot can be emptied in case of difficulty like the falling of the rope from the wheel or when the bullocks cannot run down the slope on account of exhaustion?

The remedy consists in tying a thin small rope or a wire to the lid to open a valve in case of difficulty. Mr. Bhide of Sánгли makes such arrangement at an extra cost of Rs. 1-2-0 (*vide* page 50 of my book on "Soil, its treatment, and Agricultural Implements").

*Questions dealt with by the Divisional Inspector of Agriculture,
Southern Division, Dhárwár.*

Ráo Sáheb Kulkarni gave replies to the questions addressed to him as follows:—

Mr. R. N. Rájadnya asked the following questions:—

(1) Recently good cotton seed is not available for sowing purposes in the Sátára District. All the seed available from gins is mixed with good and bad cotton seed. The old practice of ginning kapás by hand gins, for seed purpose, has disappeared. Hence there is great difficulty in getting good seed. Under the circumstances, therefore, can the Agricultural Department supply good cotton seed for sowing purpose?

Reply.—It is not only in the Sátára District that good cotton seed is not available from gins for sowing purposes. There are similar complaints from cultivators from all over the cotton-growing districts. To avoid this difficulty the Dhárwár District Agricultural Association and the Co-operative Seed Society at Dhárwár and Gadag, have started during the current year Seed Depôts. To help these Depôts in their start the Agricultural Department made arrangements for purchase of selected cotton seed on receiving advance money from the Association and Seed Societies, and thus supplied about 75,000 lbs. of seed, which these bodies distributed among their members and outside cultivators. The undertaking has been very successful both financially and also in supplying good selected seed to cultivators. Similar arrangements can be made by the Department to supply a certain quantity of selected cotton seed to Mr. Rájadnya provided an organised body undertakes to collect orders from reliable cultivators for a definite quantity of seed required and to distribute the seed among them.

Question No. 2.—He further asked about the success of Broach cotton in the Sátára District.

Reply.—The cultivation of Broach cotton has now passed its experimental stage. If the condition of soil and rainfall are as described in my bulletin on the "Cultivation of Broach cotton in the S. M. Country" the crop must give a good yield and pay better than any other local cotton. If early rains are favourable for sowing the crop and if it fails only for want of late rains in October, the crop may be given one irrigation if there are facilities to do so. This method has been successful in the irrigated tract under the Gokák Canal in the Belgaum District.

Question No. 3.—Whether green manure of San can be given to rice crop in the Sátára District?

Reply.—No. It is not practicable in the Sátára District, where rice is drilled and rainfall is scanty. It is possible only in tracts where rains are heavy and where rice is transplanted.

Mr. Pátankar, Mámlatdár of Belgaum, asked the following questions:—

Question No. 1.—Can the Agricultural Department give any useful information regarding (a) Cattle-breeding (b) poultry-rearing.

(a) *Cattle-breeding.*

Reply.—A cattle-breeding Farm on the most practical lines has been started at Tegur in the Dhárwár District just bordering the Belgaum District. Local cows are crossed with a Mysore bull. The offspring, though young at present, seem to be far better than the local. The management, housing of cattle, arrangements for grazing and storage of grass, etc., are so simple, that any ordinary well-to-do cultivator can easily adopt them. A short visit to the Farm will give a lot of information to cultivators who intend to take up

this branch of agricultural industry. There is great scope for cattle-breeding in the Dhárwár and Belgaum Districts where there are large tracts of grazing and grass lands. The grass grown on such lands is never made into hay and is thus wasted to a considerable extent. If the grass is cut at the proper time and turned into hay, I think, it would be very useful for cattle in the Malád in the hot weather, when they are starving for want of fodder.

(b) *Poultry-rearing.*

Reply—Experiments hitherto tried on the Dhárwár Farm with regard to poultry, were on a very small scale. The breeds tried were the local and Orpingtons. The experiment was not therefore financially successful. The Department intend to start poultry-breeding again on a fairly large scale to find out suitable breeds for different tracts and to supply eggs of superior breeds to intending breeders.

*Address by the Honourable Mr. S. R. Arthur, Commissioner,
Central Division, Poona.*

The *Honourable Mr. S. R. Arthur*, Commissioner, Central Division, addressed the Conference as follows:—Sir Richard Lamb and gentlemen, I think that the record of work done by the Department in the last four years is one of which it may justly be proud. It is a record of good, solid work and many-sided activity. If there is a department which exists pre-eminently for the people it is the Department of Agriculture. It may be a libel on the sister department, the Revenue Department, to say that its main function is to say to the agriculturist "I'll see that you pay your land revenue." At least, it is true to say of the Agricultural Department that its main function is to say to the agriculturist "I'll do my best to give you the means to pay your land revenue." There are two main objects mentioned by Mr. Smart which the College in Poona fulfils. It trains men who wish to take a degree in agriculture or to go through the shorter one-year course; it also serves as a centre for activity in connection with agricultural improvement and the dissemination of agricultural information. Mr. Smart went on to describe how this work is carried on. He referred to the publication of a magazine in Marathi and of a counterpart in Kanarese and he mentioned the recent starting of a school in Poona for sons of patels and substantial cultivators. These methods are both excellent in their way and will no doubt advance the cause of industrious and scientific agriculture. But it must be remembered (1) as regards the magazine that only a small proportion of the agricultural population can read and write and (2) as regards the school, which I consider an excellent move, that it can only serve a small number of agriculturists, the old motto "Seeing is believing" has double force with an illiterate population such as the Mahratta cultivator. When Mr. Smart and Mr. Knight kindly showed me over the college farm the other day and I saw the dry crop jowári standing 7 feet high and in perfect condition and bajri too in excellent condition, my uppermost thought was "If I could only transport at this moment every cultivator in the Deccan to stand where I am standing and see what can be done by the expenditure of a great deal of industry and a little money, which will be many fold repaid on dry-crop land of no particular quality, and to compare the crops on it with the dry-crop jowári and bajri, in the adjacent fields, the Deccan population would become a population of agricultural enthusiasts." We cannot transport the whole agricultural population to the college farm, but we can send selected and intelligent representatives of it to see what results are obtained there and by what method and to carry back the news to their villages and we can encourage agriculturists generally to go and see for themselves.

This brings me to a proposal for the consideration of the department which is that for the six weeks during the rains when the dry-crop results can be seen clearly, on one day every week or two days, if it can be managed, the College should be ready to receive any agriculturists who like to come, and show them over the farm and that notice of this should be read out in every village and posted in every Chavadi in the Central Division. The best means of getting them would be a matter to be decided in consultation with Collectors. It may be neces-

sary in early days for the Local Boards to organize visits of representative agriculturists and pay for their journeys, but my impression is that the information would spread rapidly and that the College agricultural 'At Homes' would not long want for voluntary visitors. The habits of the people have changed greatly of recent years and large numbers go long distances for labour, etc. This is no matter for experts. It is a matter of teaching the cultivator. "Look here. Look at this land. It is dry crop, not irrigated as you would believe at first sight. Look at that land beyond our boundaries. The land is the same. Look at their crops and look at ours. They are obtained not by heavy expenditure, simply by good ploughing, constant weeding and so much manure. Look at this iron plough—you can obtain it for so much. It requires half the number of bullocks your old wooden plough requires and then ploughs better. Your saving in cattle will pay for it in one year, the rest is clear profit." Much is done by agricultural exhibitions and demonstrations. I was present some years ago at an exhibition at Shirála in the Sátara District where Mr. Keatinge's demonstrations of the wooden plough and the iron plough, working side by side, started a considerable demand for iron ploughs in the district. A district exhibition, however, cannot show the results on dry crops of four years' careful cultivation. This is what I want to bring home as rapidly as possible to the mass of the people, who must, for generations to come, depend mainly on dry crop farming for their livelihood, and this can only be done by visits of large numbers of agriculturists to a Government Farm. I have suggested agricultural visitors being received once or twice a week for a short season only as a minimum proposal. I would prefer that it should be every day throughout the year. I quite understand the difficulty which this would present to the hard-worked College staff, and I would suggest that a selected graduate, who must be himself an enthusiast, should be appointed at the College Farm for this sole purpose. (Cheers.)

Address by Mr. Moir, Representative of the Bombay Chamber of Commerce and Bombay Cotton Trade Association.

Mr. Moir, on behalf of the Bombay Chamber of Commerce and the Bombay Cotton Trade Association, addressed the Conference in the following terms.—Sir Richard Lamb and gentlemen, on behalf of the Bombay Chamber of Commerce and the Bombay Cotton Trade Association, I now beg to tender the congratulations of those bodies to Government and to the Agricultural Department for the excellent work which they are doing, and the great and varied improvements they are carrying out and which have been briefly summarised by Mr. Smart in his report on the work of that department since the Conference of 1909.

The extension of schools and experimental stations to various districts shows how the work is progressing in the right direction and the numerous enquiries which are now being answered also point to the evident increasing interest which is being taken by agriculturists. I am specially pleased to note that extra attention is being paid to the Engineering Department, including well-boring, and to the improvement of cotton, and when the ryot has been taught that by careful cultivation and selection of seed he is greatly benefited and consequently produces improved staple in quantity, the result will be invaluable to the Trade. It is necessary to look still a little further ahead of the experimental stages, and to remember that when the cultivation and area of improved growths has been increased to what one might term merchantable quantities and the kapás begins coming into the open market for sale in the ordinary way, it will be very necessary to see that the cotton reaches the consuming markets in an unmixed state, so that the good name that has been earned will not be spoilt.

I notice that Mr. Smart has already had experience of this in Cambodia and Dhárwár-American growths and it serves as a warning for the future.

With regard to the unfortunate termination of operations with the Bombay Syndicate in Surat, I understand the position of the Syndicate was that they were forced into paying very much higher prices than the markets warranted;

for which, I think, the working system adopted during the season 1912-13, as compared with 1911-1912, was partly to blame; but as local merchants came forward and bought the tail end of the crop and the cultivators have of themselves come forward for a large quantity of farm seed for the coming season, it appears that in spite of everything much good has been derived by the action of the Syndicate for two seasons taking up the kapás at a 5 per cent. higher rate than the market value, in so much as it has put confidence into the farmers that higher prices will be obtained by careful cultivation and selection of seed. In responding so promptly to Mr. Keatinge's appeal for assistance the spinners, who formed this Syndicate, have rendered good service and the Department has thus been able to show the ryot that cotton grown from seed specially selected by the Agricultural Department would in the long run pay them better than the ordinary seed of the district.

Finally, I hope that the results arrived at on the Experimental Farms will be freely published and brought before the notice of cultivators, say by vernacular pamphlets in the various districts, so that they may be able to read of and imitate, even if they are unable through distance to see for themselves, the results of culture and progress. (Cheers.)

Address by Sirdár P. K. Bivalkar of Alibág.

Sirdár P. K. Bivalkar addressed the Conference to the following effect:—Mr. President and gentlemen, It gives me great pleasure to say that the Agricultural Department have given all those interested in the cause of agriculture, an opportunity to meet here to-day and to freely discuss some of the leading questions regarding the improvement of the occupation, which is of vital importance to no less than 70 per cent. of the population of our Presidency. I mean agriculture. Several very able and instructive papers have already been presented to you before now and comments have been made on the same by speakers who have preceded me, and I take the liberty to express my views and make a few humble suggestions regarding certain of the points raised in some of the papers, which I should like specially to emphasise.

Mr. Smart's paper opens a somewhat new and apparently promising line of work and we must congratulate ourselves upon the fact that the Director has begun personally to think that until a very widespread and comprehensive scheme of agricultural education is brought into practice and a general knowledge of improved methods of agriculture are brought home to the very doors of the cultivators, the desired improvements could not be effected, especially in the case of such cultivators as may be said to be ignorant and quite averse to leaving their lands, even for a short time, to seek for knowledge. Mr. Smart has described to us, in very vivid terms, how closely our case in Bombay resembles that of Ireland and points out that the measures adopted by the Irish Agricultural Department may be equally usefully introduced in Bombay. He has clearly pointed out that the success of that scheme lay in the general dissemination of knowledge among the cultivators and in the thorough acquaintance with the requirements of the agriculturists and their rural economy.

Personally I have been holding the opinion that unless we have an educated peasantry, the desired improvement in agriculture is impossible, inasmuch as the real improvement can only be brought about by the peasant himself rather than by anybody else. The effect of the present education imparted to the farmers' sons in the rural schools, does more harm than good to the cause of agriculture, as it creates a tendency in boys to escape farm life and to look for occupations of a wholly different character.

At the time of the last Conference, interesting discussion took place on the problem of agricultural education, but no definite conclusions, based on experimental data, were arrived at; and it was this that led me to start, as an experimental measure, an "Agricultural School" at Alibág, in consultation with Messrs. Kábraji, Smart and Dr. Mann, with a desire to devise a scheme of agricultural education, which would suit even the poorest cultivator and make his son a good peasant. As we are fully convinced that agricultural education is the only high way to have an educated peasantry, I do not quite see the

propriety of the remarks passed by Mr. Smart in "The Summary of the work of the Department" that he would not advise the starting of agricultural schools everywhere. It is my earnest desire to run the school on such economical lines as will leave very little room for undue apprehensions on the part of Government, of meeting the heavy expenditure. The school is yet in its infancy, but I strongly hope to be able to place before the next Agricultural Conference the whole scheme for general adoption, backed by three years' solid experience. The scheme of imparting the knowledge of agricultural improvements on the Irish lines, as proposed by Mr. Smart, will, I fear, not achieve success to the desired extent, as we have to deal with a peasantry of a peculiarly unsympathetic attitude. The necessary forerunner, therefore, for the scheme is the spread of agricultural education among the masses, and we had rightly expected this work of the Educational Department, but, on the other hand, it is a matter of regret that the Educational Department, instead of improving and enlarging upon the scheme of agricultural education, have actually grown unsympathetic towards it.

Equally important with the question of agricultural education is the question of the agricultural survey of the districts, for the purpose of studying the rural economic conditions, the relations between the tenant and the landholder, the organisation of the local home industries, and possibilities of utilising capital on smaller water schemes and similar other important questions. I request, therefore, that no time should now be lost in taking up the work of the agricultural survey of districts, which, when completed, will not fail to form a proper foundation for the superstructure, which Mr. Smart has planned to erect on it with the agency of the Agricultural Committees.

The constitution and the method of working of the Agricultural Committees, proposed by Mr. Smart, seem to be very satisfactory, but the way to raise the necessary funds, proposed by him, is as he himself expects, a point on which opinions may differ. I for one would venture to say that if Government are prepared to continue annually an amount equal to that raised by the Special Agricultural Rate, proposed by Mr. Smart, and to promise not to increase the special taxation on any account in future, the people may be induced to support the levying of the tax.

The next important step towards the improvement of agriculture is the development of co-operation, and Mr. Gonehalli, in his paper, has ably pointed out the necessity and the method of bringing it about. It seems from his paper that the writer has made strenuous efforts for furthering the cause of co-operation, and I think a special Government staff, in this branch of agricultural improvement, is needed at this stage in Konkan.

The demand for labour having increased of late, the rates of wages have also risen. This creates a necessity for the introduction of labour-saving machinery, and Ráo Sáheb G. K. Kelkar has obliged us much by giving his experience about some improved implements fit to be introduced. In addition to his proposals I wish to suggest that Government and rich persons might help this cause by advertising large prizes for the invention of particular labour-saving implements suited to particular localities.

There is one more point to which I wish to refer, namely, the question of the supply of Ráb material in Konkan and Máwal. I fully appreciate the value of the Ráb-substitute manures, but I also beg to point out that the cultivator is not in all cases in a position to undergo out of pocket expenditure for the purchase of the same. The cutting of tahál is done by the cultivator during his slack season, and so long as there is no other industry during this season, which can bring him more money wherewith to purchase his Ráb-substitute manures, he would naturally utilize his time for the collection of the tahál at any amount of manual labour. The suggestion made by Mr. Joshi, in his paper, about the increasing of tahál supply is appreciable only in the case of villages gifted with large warkas areas; but there is a large percentage of villages in which the increasing of the supply of tahál is impossible in the absence of such facilities. I should, therefore, suggest that Government may be kind enough to introduce a block system in the Forests of Konkan and

Máwal by which each and every village, no matter whether situated near to or away from the forests, may be permitted to cut tahál systematically from the respective block assigned to it under the strict supervision of the Forest authorities. They should be made to cut the tahál in their block within the prescribed period, after which the forest may be strictly closed altogether to the villagers until the next season. This would not only put the cultivator under great obligations to Government, but it will also ensure the safety of the forest area.

Lastly, I cannot but express that the Agricultural Department has done great good to the people of Konkan and Máwal by introducing the new crop of groundnut, which is really a paying one.

In conclusion I wish to place before you the following resolutions for favour of consideration and acceptance:—

1. That an agricultural survey of each district should be immediately undertaken by the department.

2. As the Educational Department is not willing to undertake agricultural education, it may be requested at least to give most liberal grants to start special agricultural schools.

3. That a block system for the supply of tahál may be introduced in the Government forests of Konkan and Máwal to enable every village to get tahál.

4. That the staff of the Registrar of the Co-operative Department should be strengthened by the appointment of an additional full-time Registrar and one or two paid Organizing Assistants in each district for organizing the cultivators for co-operation.

5. That substantial prizes should be advertised by Government for the invention of suitable implements in this Presidency. (Cheers.)

Remarks by Mr. S. K. Wodeyar.

Mr. S. K. Wodeyar, L. Ag., Inámdar of Chawadanpur and Mahálkari of Murgod, táluca Ránebennur, district Dhárwár, addressed the Conference on the installation of pumping plants to lift water from rivers and garden cultivation on river banks, and suggestions regarding insect pests to crops and cattle shows in the southern portion of the Southern Maratha Country.

Appointment of Sub-Committees.

Mr. Smart said:—Sir Richard Lamb and gentlemen,—I beg to propose that Sub-Committees should be appointed to consider the following papers:—

1. The Organisation of Agriculture by the Department of Agriculture in Ireland and its application to conditions in the Bombay Presidency.
2. The Milk Supply of Indian Cities.
3. The Development of Co-operation in Agriculture.
4. The Establishment of Cotton Markets in Egypt.

I beg to propose that the writers of these papers should be the Chairmen of the Sub-Committees concerned, and that the Chairmen of the Sub-Committees should select the members from visitors present who wish to serve upon such Sub-Committees. If anyone agrees to this suggestion I will ask the Chairman to put it to the Conference.

Mr. Gonehalli:—May I suggest one thing—that Mr. Ewbank should be the Chairman of the Sub-Committee regarding the development of Co-operation in Agriculture?

Mr. Smart:—I accept Mr. Gonehalli's suggestion that Mr. Ewbank should be the Chairman of the Sub-Committee on the 'Development of co-operation in Agriculture.'

A gentleman:—I beg to second the proposal.

The Chairman :—Gentlemen, the business before the Conference is that the papers which are mentioned by Mr. Smart should be referred to Sub-Committees and that the Chairmen of the Sub-Committees should be the gentlemen who wrote the papers, one exception being that the Chairman of the Sub-Committee on the 'Development of co-operation in Agriculture' should be Mr. Ewbank, and that each Chairman of these Sub-Committees should obtain from among the members of the Conference present a sufficient number of gentlemen willing to serve on the Sub-Committee and with them to submit a report to the Conference. The Sub-Committees will meet to-morrow afternoon, consider the subjects referred to them and submit their reports to the Conference meeting to be held in this place on Wednesday. Perhaps, those who are willing to join the Sub-Committees will communicate with different Chairmen, saying that they are willing to join their Sub-Committees.

Mr. Smart's proposition was then carried unanimously.

The Chairman :—We will now adjourn the Conference. The programme, which is supplied to every member of the Conference, shows what the future proceedings are. To-morrow there is no meeting of the Conference. There are College demonstrations. On Wednesday the work of our Conference will be resumed at 2 o'clock. Until then the Conference will be adjourned. (Cheers.)

Mr. Smart :—I beg to propose a hearty vote of thanks to Sir Richard Lamb who kindly took the Presidential Chair in the absence of His Excellency the Governor. (Cheers.)

The Honourable Mr. Rodda :—I beg to second the proposition. (Cheers.)

The proposition was unanimously carried and the Conference adjourned till Wednesday afternoon (17th September 1913).

THIRD DAY, WEDNESDAY, 17TH SEPTEMBER 1913.

Visits of Agriculturists to Farms.

Sir Richard Lamb, who again presided, opened the proceedings with the following observations :—Gentlemen, our business is to consider certain resolutions, namely, those that have been recommended by the Sub-Committees appointed and also one or two other resolutions which have been received. We will take first the resolution to be moved by the Honourable Mr. Arthur.

The Honourable Mr. S. R. Arthur, Commissioner, Central Division, in moving the first resolution remarked thus :

Sir Richard Lamb and gentlemen,—the resolution I wish to put before the Conference is this :—

“That this Conference is impressed by the results obtained at the College farm in dry crop cultivation on land of no particular quality; that it is of opinion that those results are within the reach of the average Deccan cultivator; that it recommends that early and systematic steps be taken to bring to the notice of the agricultural population of the Deccan districts, the results which they themselves might obtain with the necessary knowledge and application; that to this end the Director of Agriculture be asked to place an officer permanently on duty to show agricultural visitors over the farm and that the Collectors, District Local Boards and Agricultural Associations in the district in convenient reach of Poona be asked to organize visits of representative and intelligent agriculturists from all parts to the College farm to see the results and the methods by which they are obtained and to carry back the news to their homes.”

Gentlemen, you have now, I hope most of you, seen the dry crop results at the College Farm of which I spoke on Monday and to which I refer in the resolution now submitted to you.

I cannot help feeling that *so far as the mass of the population is concerned*, the College farm is at present 'wasting its sweetness on the desert air.' There it is as a monument of what the dry crop in this part might be and there are the neighbouring fields as a monument of what it *is*. You saw the private fields adjoining the farm with their stunted jowári and bájri, of which you can see the counterpart any day in any village of the Deccan, and you were able to compare them with the jowári and bájri on the College farm lands. I ask you to picture to yourselves what the Deccan might become, if every cultivator took the same care of his land. Is there any reason why the whole country-side should not become a replica of that farm? *It is not a matter of great wealth*. It is a matter of a little knowledge and some application.

One hears a good deal of the extension of irrigation as a preventive of famine and I am all for that extension, but there are limits to irrigation. The mass of cultivators must depend on dry crop. I want to organize some system by which it will be possible to bring home to the cultivating classes what they can do with dry crop.

Mr. Smart has very kindly and promptly met my wishes so far as his department is concerned. He is arranging to place an officer from Monday next on special duty for the purpose of showing the farm to agriculturist visitors. The problem then is to get representative visitors from all parts. I propose to make a beginning by asking the Collectors of adjoining districts to send leading agriculturists, *táluka by táluka*, say fifty a day or as many as the College authorities can manage, during the next month. The reason for urgency is that results are best seen while the kharif crop is still standing. The District Boards and Agricultural Associations can assist a good deal, I have no doubt, the former in financing, the latter in organizing the visits.

Apart from organized visits we should arrange to make it known widely that any cultivator who happens to make a journey to Poona will be welcome at the farm and will be shown over it. To this end I am asking Collectors to have notices posted in every village.

Many of these visitors will, I hope, go away agricultural enthusiasts, will put in practice what they have seen and exhort their neighbours to do the same, just as I am sure that you, gentlemen, will not keep what you have seen in Poona to yourselves.

I shall be glad if any one has any amendment to propose or any suggestion to offer with a view to the object at which I am aiming, and needless to say I shall be glad of any suggestion from the Agricultural Department.

Sardár Motilál Chuniál :—The resolution is very good, but so far as I find it applies to the Deccan itself. Why not make it general? Why not have the resolution worded in general terms so as to permit cultivators from other districts—Gujarát and elsewhere—to visit the Poona Farm? I think the Poona Farm is worth being visited by cultivators of distant parts. My suggestion is that the word 'Deccan' be taken out of the resolution.

The Honourable Mr. Arthur :—May I explain? I speak for that part for which I am responsible. I shall be very glad to help in any way I can visitors to Poona from any other districts.

Sardár Motilál Chuniál :—As this resolution is applicable to the Deccan, I suggest that only the word 'Deccan' be taken out of it.

Mr. Páregaonkar of Sangamner :—Gentlemen, I am very glad to hear that the Honourable Mr. Arthur takes interest in bringing agricultural information to the very door of the agriculturist. With respect to his suggestion that the District Local Boards should manage to send agriculturists from each *táluka* to visit the Agricultural Farm in Poona, I fear that those District Local Boards, who have very scanty money, would probably not be able to send many agriculturists from their *tálukas*. That will be one of the difficulties in the way of the District Local Boards. I will explain the difficulty more fully. Suppose it will cost Rs. 8 per cultivator to send him to the Poona

Farm and suppose about 100 cultivators were to come from each taluka and also suppose there are 10 or 11 talukas in a district, then the total cost will come to about Rs. 8,000.

The Honourable Mr. Arthur:—I think I said that some of the well-to-do cultivators will be able to finance themselves. With reference to Mr. Paregaonkar's explanation about the cost of sending a number of cultivators from different talukas and with reference to his remark that some of the District Local Boards would not be able to meet that cost, I wish to say that Government should supplement the means of the District Local Boards by contributing half the expenses. Some of the cultivators will thus be able to visit the Farm. That is my main object.

Mr. Paregaonkar:—Gentlemen, Mr. Arthur asks you to bring the agricultural information to the very door of the agriculturist. In this respect I well remember at a Conference of the Agricultural Department the Honourable Sir John Muir Mackenzie, while delivering his presidential address at Ahmedabad, rightly referred to the fact that some experiments should be carried on in some tracts in order to impart agricultural knowledge to the farmers. These experiments should be carried out and undertaken by the Agricultural Department in tracts where some improvements are to be expected. They should be so carried out that the cultivators of the surrounding parts would come to know of their value and the general result will be that the cultivators will take up the experiments for themselves. Of course, this is a matter of expenditure, and formerly it was stated that the Agricultural Department had not got sufficient staff to undertake the experimental work. Now, I think, the Agricultural Department is in a better position in the matter of staff, and, perhaps, it will be able to undertake such demonstrations. It will not be the case that they will be wanting in funds; so, with the united voice of this Conference the Agricultural Department authorities should be requested to make such demonstrations, and if they are in want of funds, Government may be requested to make liberal grants of money to the department for such a worthy cause. Those who are united together in the interest of the 70 per cent. of our population—the population of the Bombay Presidency—feel that if the Bombay Government will spend some more money on this worthy cause, it will not be spending it in an out-of-place matter. I was confidently told that the Bombay Government is spending more on grants compared with any other Provincial Government in India. Well, it must be remembered that out of the sum of some crores of rupees which are generally budgetted, we spend Rs. 9 lakhs on agriculture. If I am not far from right, I think, we will be spending only 1 to 2 per cent. for such a worthy cause, which is connected with the interest of 70 per cent. of our population.

The President:—Will you please finish? We have a good deal of business to go through to-day. It would be better if you restrict your remarks to the resolution now before the Conference.

Mr. Paregaonkar:—I hope Government will be more liberal in their grants to the District Local Boards to enable them to send more cultivators to the Agricultural Farm in Poona.

The Honourable Rao Bahádur S. K. Rodda then rose and said as follows:—

Mr. President, members of the Agricultural Associations and gentlemen,—I feel great pleasure in supporting the proposal brought forward by the Honourable Mr. Arthur. It refers to the advantages resulting to dry crops in many of the districts of the Bombay Presidency. In the Bijápur, Belgaum and Dhárwár Districts the officers of the Agricultural Department are now experimenting with dry crops and showing the advantages arising from the dry crop system. Mr. Arthur intends to show to the cultivators the advantages derived from the dry crop system followed in the Agricultural Farm in Poona. I think that system is worth the strong support of every agriculturist and of every other individual who has the welfare of the agriculturists at heart. There is the question of providing funds to the District Associations and the Local

Boards, but that is a matter which you will have to consider hereafter and should not form a subject of this resolution. The question of Government grants in this connection should not be included in the resolution moved by the Honourable Mr. Arthur. That resolution should be passed *in toto* as it stands with the word 'Deccan', as suggested by my friend the Honourable Sardár Chunilál Motilál, being deleted, so that the resolution be made applicable to the whole of the Presidency. With these words I again heartily support the resolution which, I am sanguine, will be unanimously passed by the Conference. (Cheers.)

Mr. Smart addressed the Conference thus :—

Mr. Chairman and gentlemen, on behalf of the Department I should like to say that I am perfectly willing to accept the Honourable Mr. Arthur's resolution, and I would request Sardár Motilál Chunilál to withdraw temporarily his amendment, because, I think, the object of this meeting should be to try this experiment first of all, on one particular farm. I have met Mr. Arthur's views by appointing Mr. Kogekar for one month for the present, and I am also willing to appoint him for a further period for the purpose of helping Mr. Arthur's project. (Cheers.) I think, before we go further, we should see how far the Local Boards are ready to act and how far the cultivators of this part respond to the call made on them by this resolution. I think Sardár Motilál Chunilál will, taking my remarks into consideration, withdraw his present amendment. I hope you will pass Mr. Arthur's resolution as it stands.

Sardár Motilál Chunilál :—I have no objection to withdraw the amendment, but one thing I should like to say, and it is this that the Honourable President will kindly promise me that I should move this amendment next year. After we have seen the results of this trial, I may be permitted to move a resolution to extend the application of the present resolution to the whole of the Presidency. On that condition I withdraw my amendment. After you have tried the new system in the Deccan and found that it has proved successful, then I may be permitted to bring forward, at the next Conference, a resolution that the new system be extended to the whole of the Bombay Presidency.

Mr. Smart :—I will suggest to the Sardár that after the results of these experiments are known, he should approach the Director of Agriculture with a proposal that a similar resolution should be made applicable to the Surat Farm for the sake of the cultivators of Gujarát, and the Honourable Ráo Bahádur Rodda may do likewise for the Southern Districts. I think that would meet the wishes of both the gentlemen.

Sardár Motilál Chunilál :—I withdraw my amendment.

The Honourable Mr. Arthur :—I do not wish it to be inferred in any way, from what I said, that I disapprove of garden cultivation. This morning I saw most excellent results at the Mánjri Farm, and if Mr. Smart would carry out demonstrations simultaneously with garden crops all the year round, there is nothing that would please me better. This is rather a new departure, and we depend mainly on the dry crop cultivation. My primary object is to show people of this part of the country what they might do really with their ordinary dry crop.

The President :—I am not perfectly certain Mr. Arthur is right in saying this is absolutely a new departure, because, my recollection is that we have, from time to time, paid money to bring people from other places to see the crops on the farm and the demonstrations. Mr. Arthur's proposal only is to maintain the course, we have already started, in a somewhat more systematic fashion. I would not call it an absolutely new departure. You will be satisfied with Mr. Smart's suggestion that, having tried the experiment here in a regular and methodical fashion, we should proceed, after having watched the results and if they are good, to try similar plans at Surat for Gujarát and at Dhárwár for the Southern Marátha Country, because it would not be very easy to bring people from a distance, and we have model farms at Dhárwár and Surat.

The resolution does not say anything definitely. The Conference is only asked to pass the resolution, because it refers to the tentative operation of this scheme. The resolution expresses the hope that the Local Boards and Agricultural Associations will organise the visits of cultivators. There would be no difficulty in providing ways and means if the Department of Agriculture desires to assist the Local Boards. I don't think the Financial Department—the Chief Secretary is here—will make any bones about granting reasonable sums of money to help them. With these words I put the resolution to the Conference, which Mr. Arthur moved, and I put it without any amendment. (Cheers.)

The resolution was carried unanimously.

Recommendations of Sub-Committee on the Irish Organization of Agriculture and its application to conditions in the Bombay Presidency.

The Honourable Mr. Godbole delivered the following speech in reference to the recommendations of the Sub-Committee on the 'Irish organisation of agriculture and its application to conditions in the Bombay Presidency':—

Mr. Chairman and gentlemen, I would say at the outset that I quite sympathise with the object of the 'recommendations' of the Committee, which have been drafted and placed before us. But I object to the levying of a local cess of a pie for every rupee on the Land Revenue every year. I object to the raising of this Fund. The resolution proposes that we should charge one pie extra, and I am opposed to that suggestion, and I would tell you why. Most of the Local Fund revenue, that is realised at present, is realised from the 'jirayat' cultivation. Look at the position of that cultivation. Cultivators get a crop every three years. Even this year—it is said to be a good year as regards rainfall up to now—even this year, a friend of mine, who has started agriculture at Bijour, told me that on account of the want of rainfall cultivators there have been put to the necessity of taking out their bajri crop, because the crop is drying, and, in order to use this bajri as fodder, they have thought it advisable to take out the crop entirely, because there is no hope of getting any grain. This is a cultivator's description. If you want to charge one pie extra from the cultivators in the shape of a local cess, one pie looks a very small amount, but to those poor cultivators it is a very large amount. The explanation given by my friend this morning was this. The cultivators sow bajri and, having to incur expenses, they have been working hard to get a bajri crop. The money value of their labour is to be considered also. I include the labour of the cultivator himself, his wife and his grown up children. They have to employ this labour to grow their crop, and what has been the result? They have been obliged to remove this bajri crop. I will, therefore, promptly object to any proposal which lays any additional burden whatever on 'jirayat' cultivation of our Presidency. The suggestion of Mr. Smart is that this new cess should be voluntary. How can it be a voluntary cess? You must not be led away by words. It may be voluntary to a certain extent, but it will be compulsory. What is meant by calling it a voluntary cess? This is what the District Local Boards will do. Six or seven officers of the district and probably seven or eight or 10 or 15 non-official members will pass a resolution making the cess binding on the cultivators of the district without their being consulted. Probably the District Local Boards will pass the resolution voluntarily, but that does not mean that the rate becomes a voluntary rate to be recovered from people who actually pay it. Mr. Smart has placed his proposal in a tempting way and he will probably strain every nerve to get the cultivators to accept it. What I propose is that in order to secure the advantages that Mr. Smart has in view, a scheme should be started under which the District Local Boards and Government should contribute to this cess. In the Appendix I to Mr. Smart's Report, I find that from the one pie rate the collection would be Rs. 1,68,904, and Government contribution will be Rs. 84,447. Now, what I propose is that the District Local Boards should be asked to contribute to the extent of $\frac{1}{24}$ of the revenue that they derive from land in the shape of one anna in the rupee. It means that they will have to contribute $\frac{1}{24}$ th of the revenue or at the rate of $\frac{1}{2}$ a pie per rupee of the revenue that they derive from

land at the one anna in the rupee rate. I would like to ask the District Local Boards to contribute to that extent, and I would ask Government to give us double that amount. That is to say, I would ask the District Local Boards to give us Rs. 84,447 and Government to give us double that, that is Rs. 1,68,904. I would only reverse Mr. Smart's order. That is to say, the entire expenditure should be divided between the District Local Boards and Government in the proportion of one to two, one-third of the cost being borne by the District Local Board and two-thirds by Government. I find that the District Local Boards Act of this Presidency, as it stands at present, authorises, under section 30, sub-section (h), the Local Funds to be laid out for the establishment and maintenance of model farms. (Reads the sub-section.) This is one of the objects on which one-third should be legitimately expended by the District Local Boards, that is only one-twenty-fourth of the revenue that they derive from one-anna cess. This particular object is laid down in the Local Boards Act. And the remaining fund should come from Government. Government, at present, are receiving very liberal grants from the Government of India for education in general and for technical education in particular, and agricultural education imparted to the ryots is one branch of technical education; so, I don't see any reason why a substantial portion of the Imperial grant should not be utilised for this purpose. The proposal that I have put forward will thus enable us to get the full amount that is required to work out this scheme, and the scheme can be carried out in its entirety without imposing any extra burden on the 'jirayat' cultivation of this Presidency. With these remarks I would place before the Conference the following amendment for its acceptance:—

“That this Conference approve the general scheme of organisation of cultivators in the Presidency, as proposed by Mr. Smart, and they are of opinion that the District Local Boards and Government should contribute to the requisite fund in the proportion of one to two, and that the Conference also consider that the Local Fund contribution may be made available by requesting the District Local Boards of the Bombay Presidency to pay 1/24th of the existing one-anna rate towards the scheme, and that the Conference do not consider it advisable to levy any additional rate on the ryot for carrying out this scheme”.

Gentlemen, I beg to place this amendment before you for your acceptance. The general scheme, which has been laid before the Conference, is very tempting and one that is calculated to improve the Deccan agriculturists to a marked extent, and I personally believe that the members of the Conference will be extremely loath and unwilling to take no practical action upon it. As the scheme has an educational basis, I do not see why the Provincial and Imperial Funds should not come to our help in the light of this resolution. With these words I beg to place the amendment before you, gentlemen, who are the members of this Conference, for your acceptance.

Mr. Smart :—Mr. Chairman and gentlemen, you have heard the Honourable Mr. Godbole's remarks. Let me say that his suggestions were all put before the Sub-Committee, concerned with this proposal, and considered and rejected. The ground on which they were rejected was that the Local Boards Act was passed in 1886. Since that day no Local Boards have expended any money at all on agriculture. It is perfectly useless now to ask them to give 1/24th of their funds. If they could have done it, they would have done it before. They cannot do it now and Mr. Godbole's proposal, therefore, comes to this, that you have to reject the scheme altogether. All the points made by Mr. Godbole were considered by the Sub-Committee and were rejected on the ground I have stated. I have no more to say on the subject.

The President :—Mr. Gonehalli, will you tell us what you have heard from the Thána and Kolába Districts?

Mr. V. H. Gonehalli, M.A. :—Mr. Chairman and gentlemen, I have received two representations from cultivators in the Thána and Kolába Districts. One is signed by 161 cultivators and the other by 57. They ask me to bring to the notice of the Director of Agriculture, His Excellency the Governor in Council and this Conference that they are anxious that the scheme of agricultural or-

ganisation, prepared by the Director, should be approved by this Conference and Government. They solicit that Government may be pleased to agree to the increase to the Local Fund Cess from 12 to 13 pies per rupee and urge that an adequate agricultural staff should be maintained for introducing in the country on a large scale improved implements and seeds; for establishing agricultural schools, for maintaining breeding-bulls, for promoting the construction of wells, and so on.

The ryots, who have asked me to represent their opinions to the Director and His Excellency's Government, point out that agriculture is as widespread as the human race; and that in order to improve it it is necessary to employ a widespread agency and incur liberal expenditure. They regret that, being uneducated, ignorant and poor, they are not in a position to bring to the notice of the authorities their opinions on the measures calculated to improve their prime industry at the proper place or time or in the proper manner. Therefore they request me to place their humble views before His Excellency the Governor and the Conference. They finally ask me to convey to the authorities the opinion which is widely shared by their fellow ryots that the first thing to do is to raise adequate funds by increasing the Local Fund Cess from 12 pies to 13 pies per rupee and by contributions from Government.

I trust, gentlemen, that the views of these ryots will receive your sympathy and thoughtful consideration. At the same time, gentlemen, I regret to state that at gatherings like this, the very classes of people—to devising measures for whose welfare they are convened by Government—those classes are not adequately represented. It is true that under the present educational condition of the agricultural classes, which are certainly very backward, they cannot hope to have a better share in these affairs. It is, however, not only my hope but also that of many others that matters will improve in the course of years to come and that the cultivating classes will be able to participate more and more in agricultural and kindred conferences and give their valuable, effective and weighty support to measures calculated to benefit them—the measures—which may be brought for consideration not only before a Conference like this, but also before higher and more responsible assemblies, which deliberate on the more important affairs of the State. Meanwhile, I trust that you, gentlemen, will give all reasonable consideration to the opinion of the ryots which I have been asked to represent to this Conference.

Sardár Motilál Chuniál:—The question is whether consideration should be given to the proposal of Mr. Godbole that no cess should be levied, as suggested by Mr. Smart, and that Government should contribute 2/3rds and the District Local Boards 1/3rd. I am not concerned really with the ratio in which Government should contribute and the District Local Boards should contribute. The question that arises is whether, whatever small ratio the District Local Boards are expected to contribute, they will be able to contribute or not. As Vice-President of one of the richest District Local Boards in this Presidency, which has a very large income, I find from experience that it is very difficult for them, for some years past, to make two ends meet, and if any contribution is required from that Board or from any other Board, they will not be able to give that contribution. They find it impossible to grant the requests of people who say 'We want agricultural improvements.' Funds for the new scheme can be only devised by extra taxation imposed generally by an Act or by a voluntary contribution of the people. So far as the present resolution is concerned, I think the new cess should be levied as an optional contribution. It should be a tax paid by people voluntarily. You may call it a tax or a contribution to be raised by voluntary subscription. When the option is to be left with the people, the result ought to be left with them. If the Conference agrees that the District Local Boards should contribute 1/3rd, then they will not be able to contribute anything. Any man may say 'We want this very urgently,' but absolutely there is no money coming from anywhere. (Cheers.)

Báo Sáheb P. T. Pandit (of Dhárwár):—Mr. Chairman and gentlemen, I rise to make only a very few remarks. I have carefully gone through the paper of our worthy Director, Mr. Smart, on the Irish system of Agricultural

Organisation and its application to Western India. Gentlemen, I also happen to be one of those who have visited the seat of the Empire and have some first hand information about the United Kingdom. Standing in this Hall I make bold to declare that the scheme carefully prepared by Mr. Smart is the only scheme hitherto prepared, and which bids fair to prove a great boon to the suffering and indigent agricultural community of this country. In the absence of any other definite scheme of agricultural organisation forthcoming from any other authority, it is only fair, I argue, that Mr. Smart's scheme should deserve well of this Conference and be carried by it. I, therefore, propose that the legislative sanction proposed to be asked by the Director should be graciously accorded by Government, when the scheme comes before them at the proper time. (Cheers.)

Mr. M. B. Maráthe:—I want to say a word on the resolution that has been brought before the Conference for its acceptance. There is an amendment proposed by the Honourable Mr. Godbole and it is based on two grounds, *viz.*, (1) that he is against the levying of an additional taxation, and (2) he has some fear about the optional character of the taxation. As regards the first objection I would at once say the whole resolution is based upon one principle, and that principle is that Government help those that help themselves. There are so many schemes before Government, which require money to be spent on them, and it is but quite natural that Government have not enough money to spend on these urgent schemes. Even if Government were willing to spend money on agriculture, it would not be able to make any great improvements in agriculture. It is rather a suicidal policy to advocate the principle of levying taxation and incurring expenditure. I would rather belong to that class who would advocate the principle of necessary taxation and a very profitable expenditure. I would submit that this taxation is necessary and it is a small taxation, indeed. However I would suggest a modification based on the Honourable Mr. Godbole's amendment to the effect that 'the Government will be pleased to enact a law empowering the body of non-official members of the District Local Boards.' Mr. Godbole says the District Local Boards have more than five or six official members and that their presence would make other members submit to the levying of this additional taxation. I would leave this matter to be decided by non-official members of the District Local Boards, so that the official members could not be said to decide whether the additional rate should be levied or not. I would like to suggest an amendment to paragraph 1. (Reads the paragraph.) I would like to put in the words 'Non-official members of' after empowering. The whole control should be given to non-official members. These are the suggestions which I would like to make, and subject to them I would heartily support the whole proposition.

The Honourable Ráo Bahádúr S. K. Rodda:—Mr. President and gentlemen, I have been connected with District Local Boards for more than thirty years, and I can say from my own experience how much money is now spent on compulsory duties by the District Local Boards and on optional duties by the Local Boards. The Local Boards Act was first passed in 1869 and, after undergoing many changes, it is still in force. Mr. Godbole has misunderstood one thing. Our Director of Agriculture wants the agriculturists to work on the principle of self-help. His scheme has nothing to do with the District Local Boards, except as bodies through whom the rate could be realised by law. The whole thing comes to this that in the opinion of the Director of Agriculture the scheme should be worked out entirely by the Agricultural Committees, and what are these Agricultural Committees? What is to be their constitution? The constitution of these Committees is that each Committee should consist of a certain number of persons from each taluka, who would necessarily represent the agricultural interests of the taluka, and an equal number from the District Local Boards. This would mean not officials but non-officials, though generally there may be one or two officials who may be especially interested in agriculture included. And lastly, outside the sphere of District Local Boards there should be one-third of the members, who are persons specially interested in agriculture, and these persons will be nominated by the Collectors. So, these Committees of Agriculture will be entirely independent bodies working with funds received from Government and from the raising of an additional taxation of one pie in

the rupee every year or one anna during the course of 12 years. Bodies thus constituted and entrusted with the responsibility of managing their affairs, can do their work more efficiently with the expert advice of the official and non-official members of the District Local Boards. How much these District Local Boards are saddled with expenses may be seen from the evidence which you can read in their reports. In those reports you will see that the District Local Boards have spent a very small and very insignificant sum on agriculture. Therefore, I propose that we should consider Mr. Smart's scheme as worthy of consideration and that it should be adopted by the Conference. The money so collected will be spent by agriculturists, because it will be collected from the agriculturists, and under no circumstances and at no time can it be diverted from the legitimate purpose for which it will be levied. Additional taxation will be necessary in all countries, and especially so in a country like India. The scheme would seem to be like the pill which, when swallowed, tastes very bitter, but in the long run gives very sweet results. So, without making any change in the constitution, as proposed by Mr. Maráthe, or without taking into consideration the objections of Mr. Godbole, I would support the recommendations of the Sub-Committee in their entirety. (Cheers.)

Mr. Páregaonkar:—I think in one respect the scheme is defective. There is no provision made in the scheme to receive funds raised by voluntary subscriptions by bodies, such as the recognised Agricultural Associations or Táluka Associations or District Associations. I think such a provision should be made in the scheme. That is the only point I wanted to call the attention of the Conference to.

Mr. Smart:—I don't think they have any funds.

Mr. M. B. Maráthe:—If you tell them to get money from Agricultural Associations, that would be an additional burden on the agriculturists. I am Secretary to the District Agricultural Association of Belgaum, and if we were to give some more money from the Agricultural Association, it would take so much money more from the agriculturists themselves who are taxed.

The Honourable Mr. B. S. Kámat:—Mr. Chairman and gentlemen, as one of the members of the Sub-Committee I have signed this report, and I, therefore, would like to make a few brief remarks as to the considerations that weighed with me when I signed the report. As Mr. Smart has told us, all the objections, which the Honourable Mr. Godbole has just stated, were placed before the Sub-Committee by me, and if Mr. Smart had some difficulty, at all, in the Sub-Committee in getting this principle accepted, it was from my hands. I started the objection that if we accepted the voluntary agricultural cess, it would involve the principle that we relieved the Agricultural Department from all responsibilities and that we took up their duties. I said it was for Government to help the agriculturists. Secondly, I thought, from the point of view of District Local Boards, that even if they accepted the principle, they would be in a position to help us with the amounts we wanted. However, when we discussed the question fully I found from my colleagues, coming from the distant parts of the country, from Belgaum, Dhárwár and other places, the actual experience was that the District Local Boards for the last 30 years have not been able to contribute anything towards agricultural improvements. Then the next question that occurred to me at once was 'Are we to wait till Government is able to help us in helping the cause of agriculturists, or whether we should push on the cause of agriculturists for which we are striving so much? If we raised a certain amount, Government would at once help us with an equal amount. Supposing the District Local Boards put together the sum of Rs. 1,000, we expected Government would contribute another Rs. 1,000. We considered whether we should help ourselves and accept half the loaf from Government or we should do nothing at all and wait till Government helped us?' We thought whether we should object to the scheme involving more-taxation or carry forward the cause of the agriculturists? (Cheers.)

Mr. E. H. P. Jolly (of Jalgaon):—Gentlemen, with my very limited experience I do not wish to press this point very much, but I think it would be sufficient if I could let gentlemen know that my experience in East Khándesh is that the District Local Board there cannot bear any additional item of expenditure. The District Local Board of East Khándesh is, perhaps,

one of the richest, if not the richest, District Local Boards in that part of the country, but this year they were compelled to budget for a deficit in education. So the people have to meet this deficit. I have been in Khándesh one year, and I have pointed out to the people that they can expect no assistance from the Bombay Government for increased educational demands. People have understood this and they have come forward quite willingly to subscribe 2 annas, 4 annas and 8 annas on the land revenue for establishing schools. The Chopda Taluka has voluntarily subscribed Rs. 40,000 for educational purposes. There was no pressure and no complaint. People were merely told if one village did not subscribe, the money would be raised elsewhere. So, the people have at once solved their own educational problem, and, I believe, they would be equally willing to help the agricultural scheme. In this connection I would suggest an alternative clause that instead of raising an annual rate of one pie in the rupee, the rate of one anna in the rupee might be raised. This idea was suggested in East Khándesh, when a Taluka Agricultural Association held a meeting about three years ago, and it was there resolved that all the villages of the taluka should be invited to subscribe at the rate of one anna per rupee, that is to say, subscribe equal to the Local Fund Cess. At present where there is every possibility of a bumper harvest, this additional taxation will not be felt as a burden and it would raise Rs. 70,000 quite easily instead of Rs. 6,000 or Rs. 7,000.

Mr. D. N. Desai (of Surat) :—Gentlemen, although so many people have spoken in favour of this proposal, in a few words I will try to explain that the proposal should be carried 'in toto.' The main objections raised against the proposal are two only, first, that people should not be burdened with one-pie more taxation, and, secondly, that the taxation would not be voluntary but compulsory. I should say both these objections are groundless. I say, if we are to accept the scheme at all, we should not wait till Government is prepared to finance us. Perhaps, Government may not give any funds for many years to come. I would go further and say that even if Government is now prepared to finance us in this matter, I would prefer that people should contribute their own money rather than that Government should help us in all matters. This one-pie cess won't fall as a burden on the cultivators; it is 1/12th of the present rate. Each of the farmers pays that once in a year. By adopting the present scheme we shall be getting tuition in managing our own affairs without expecting any external help. By always accepting Government help or outside help we become enslaved. In order not to become enslaved, we should foster the spirit of self-help and self-dependence. With these words, gentlemen, I would exhort you to accept the scheme 'in toto,' and without any change whatever. (Cheers.)

The President :—Are there many more gentlemen to speak? I think that if there are many gentlemen to speak in support of the resolution, I would ask them not to speak. We have heard sufficient in support of the resolution. Is there any gentleman wishing to speak in support of Mr. Godbole's amendment? If there is such a gentleman, I would ask him to speak. We have still five resolutions to pass in two hours. Therefore, I would ask only those gentlemen to speak who wish to speak in support of Mr. Godbole's amendment and not in support of the resolution. Of that we have got quite enough.

Mr. S. D. Navalkar (of Bombay) :—Honourable President and gentlemen, I beg to support what the Honourable Ráo Bahádur Godbole has said. I should like to propose one more amendment, viz., that in the interest of the agriculturists of this country, this Conference requests Government to contribute money to support Mr. Smart's scheme from the fund that they derive from the large public revenue. With these words, gentlemen, I beg to second Mr. Godbole's amendment.

Mr. Smart :—May I know your name, please?

Mr. Navalkar :—My name is S. D. Navalkar. I propose my amendment, because I see that Government has not been contributing a large amount of money for agricultural purposes. 70 per cent. of the population of this Presidency derive their livelihood from agriculture, and if these 70 per cent. pay their revenue

to Government, it is the bounden duty of Government to contribute their mite, at least, in the interest of the agricultural population from the revenue derived from these people.

Rao Bahádur Icháram Bhagwándás :—Mr. President and gentlemen, I have consulted my friend, Mr. Godbole, and he says that if I bring forward the amendment, which I am just going to move, he will withdraw his objection to the scheme. I am very glad to put my little amendment as follows. I don't want to make a big speech, as much of our time has been already spent. Most of the objections raised to this scheme are based on the fear of taxation. Gentlemen, as you all know, direct taxation, wherever it is made, is very unpopular. So, I propose we should have an indirect taxation. You all know that in all districts the excise-revenue is received in the form of a tax. The District Local Boards receive the excise-revenue at one anna per year. Excise-revenue will not touch agriculture direct. So I propose that a word might be added whereby "excise-revenue" be substituted for "land revenue." Another thing is that the excise-revenue is growing every year. It is also paid by the agriculturists and by the commercial classes. It is derived from them on articles of luxury. As this is not directly paid, it will not be felt by the agriculturists. The District Local Boards should take one pie in the rupee of the excise-revenue as an indirect tax. I was a member of the District Local Board and I found from personal experience that there was no balance, at all, to be paid for agricultural improvements. There is no balance from the existing revenue; it is, therefore, necessary to raise a local rate. It is desirable that this general rate should come from the excise-revenue. This will remove Mr. Godbole's amendment.

The President :—As regards the last amendment that has just been moved, I understand from my friend, Dr. Mann, who takes a great interest in excise affairs, that he would oppose the amendment very strongly indeed. To my mind the amendment appears absolutely impracticable. I cannot conceive how you can enact a law permitting the District Local Boards to raise the rate of one-pie in the rupee of the excise-revenue. I don't know how you can get the Local Boards to raise the revenue of a pie in the rupee of the still-head duty. How can it be done? As regards the general resolution, there is one amendment which is suggested by Mr. Godbole and seconded by Mr. Navalkar, which does away with the empowering of District Local Boards to raise any rate, but requires them to contribute 1/24th of their revenue and asks Government to pay double that amount. The considerations against that course, that have been put before the Conference, appeal to me very strongly and I am convinced by those considerations. I presume that the amendment will not find its way to your acceptance. I presume the proper course for me to pursue will be to ask your opinion first on the amendment proposed and then get your decision as regards the resolution of the Sub-Committee. It is said that the funds of District Local Boards are not sufficient to meet any more demand made to reduce their revenue by 1/24th. That was a matter which, I think, came forward before the Legislative Council, and a somewhat similar proposal was made by my Honourable friend, which also, I am afraid, could not commend itself to the acceptance of the Council. The constitution of the Committees, which are to be formed, is suggested in paragraph 3 of the resolution, and I understand Mr. Maráthe wants to insert in it the words 'non-official members.' That has not been supported by anybody in the Conference; perhaps, he would not press it; it is merely a recommendation. The resolution may be taken as an indication of the general lines to be approved by the Conference. The exact form of the constitution will be a matter of a great deal of discussion. The amendment, which is before me, I am afraid, I have not taken down. However, you remember the effect of it. It is proposed by the Honourable Mr. Godbole and seconded by Mr. Navalkar. (Puts the amendment to the vote and finds only three members of the Conference to be for it.) The amendment is lost by a considerable majority. (Cheers.) What is now before the Conference is the recommendations of the Sub-Committee, which are on the printed paper. Those who are in favour of that resolution—of these recommendations—will hold up their hands. (After counting the votes.) The resolution is carried unanimously. Now, gentlemen, we will come to Resolution No. 4, which is on the printed paper. The proper thing for us to do is

to consider whether we should adopt this report of the Sub-Committee. Does any gentleman wish to make any remarks on this resolution ?

Recommendations of the Sub-Committee on the milk supply of Indian cities.

Dr. Mann :—Gentlemen, I ask you to pass this resolution about the report of the Sub-Committee :—

‘That this Conference accepts the report of the Sub-Committee with regard to the milk supply of Indian cities.’

I find that the Sub-Committee submits three or four propositions. The first proposition is this :—

‘That the quality of milch cattle is deteriorating.’

If the Conference takes up this question it will be able to contribute very considerably towards the improvement of milk supply. The second point is with regard to the milk supply of Indian cities :—

‘That Government should appoint experts to investigate sites near big cities and to find the best places where the present cattle of these cities should be removed and located.’

Such experts, speaking of Poona, for instance, would investigate the neighbourhood some miles round Poona in order to find the best place for the location of dairy cattle. If you accept this proposition, it involves one important point. It is eminently desirable to get the cattle away from the cities. The present condition of cattle, inside the city of Poona, is very undesirable. No one gets pure milk so far as it is derived from cattle inside the city. Hence, the necessity for experts to select places where the milk farms can be best located. The third point is :—

‘That it is eminently desirable to consider what steps should be taken to improve the breed of cattle with a view to secure a better quantity and quality of milk without the price being raised.’

It is only when the milch cattle get improved that milk will ever be cheap. It is suggested that the Agricultural Associations or other special associations, organised for the purpose, should be asked to keep herds of special milch cattle. They should maintain good milking breeds. The fourth point is :—

‘That shows of milch cattle should be held and substantial prizes be offered for the best exhibits.’

We know very little about the best breeds, and it is emphatically necessary that we should know it. The Sub-Committee think that it is so important that the milch cattle should be taken outside the cities to places which are suitably situated, that they recommend this Conference to ask Government to actually assist, whether by money, land or other methods, in the establishment of such milch cattle in suitable situations, provided the owners submit to Government inspection. Whether the establishing is done by capitalist agencies, or by company organisations or Co-operative Associations is another matter. I pray that, in dealing with the question of milk supply, the Conference will feel that they are dealing with a question which is extremely important. This is, of course, an agricultural question, and it is concerned with the whole future of the community and I think the Conference should distinctly ask Government to assist them in improving the milk supply ; but it may ask partly for this reason also, that this is a sanitary measure. I will, therefore, ask Government to assist the industry ; and perhaps, they would not be more justified in giving that help to any other industry than this, in which I am interested. (Cheers.)

The Honourable Mr. Godbole :—I strongly urge that this report be accepted by the Conference. I only suggest that *Dr. Mann* should make a small addition to his proposition by including in it ‘milch goats’ also, because, you know, gentlemen, that much milk, that is given to children, babies and others, comes from goats, and it is very desirable that milch goats should be specially included in the proposition.

Dr. Mann :—I am quite ready to accept the suggestion of adding goats in this resolution.

Mr. Páregaonkar :—I beg to second the resolution.

Mr. D. C. Anjaria (of Káthiáwár) :—Mr. President and gentlemen, I come from Káthiáwár—from one of the Native States. I am in charge—I am the manager of the cattle-breeding farm. There we have about 2,000 cows, which are the best milking cows. We have produced better calves and have also improved the milk-properties of our milch cattle. Only last year we purchased many cattle when there was famine in Káthiáwár from the Mahájans, who took great interest in feeding milch cattle. From the Slaughter House at Bándra we saved many cows. From the worst cows we have produced good cattle by importing stud bullocks from Gondal and other places. You will be pleased to hear that now we have got best bullocks and best cows on our farm. The neighbouring States of Morvi, Wánkáner, Dhrángadhra, Rájkot and others are taking away our cows, buffaloes and bullocks. Our two months' calves fetch Rs. 50. Our bullocks fetch from Rs. 150 to Rs. 200. We can produce the best bullocks, which are the backbone of our agriculture. Therefore, I strongly support *Dr. Mann's* proposal.

The President :—Gentlemen, this resolution goes beyond the function of the Agricultural Department. We are an Agricultural Conference, and the question of milch cattle and of providing a system of a proper supply of milk though a right one for us to consider, also goes beyond the function of the Conference. It affects the health of the people and different matters which concern the Sanitary Department and the Municipalities. This question and the question of appointing experts to investigate with regard to big cities I don't think I, as a Member in charge of the Revenue and Agricultural Departments, can properly accept. I should look to my friend, *Mr. Pattani* (Laughter) to accept them. I admit that it is a good thing that this should be investigated, but, I think, you should understand that if I, in the Chair to-day, indicate that this Conference may well accept the resolution, I am not committing myself as a Revenue Member. I leave that to my friend, *Mr. Pattani*, who is in charge of the Sanitary Department and Municipalities. I am not committing myself for the provision of funds for sanitary acts or for experts to investigate or for various other items which have been accepted by the Conference. All I can say on behalf of Government is this that when this resolution of the Conference comes before us in the regular way, we will certainly give our close consideration to it, and we shall be very glad if we can devise means to give effect, in a more regular way, to the recommendations for the reform of the milk supply. (Cheers.)

The resolution was put to the vote and carried unanimously.

Recommendations of the Sub-Committee on the system of Cotton Markets in Egypt.

Ráo Sáheb V. K. Joglekar, Vice-President, Taluka Local Board, Karajgi, Dhárwár District, in moving the next resolution observed as follows :—

Sir Richard Lamb, Sardárs, and gentlemen, the resolution, which I am allowed the honour of submitting to you for your kind consideration and acceptance, runs as follows and refers to the introduction of the Egyptian system of Cotton Markets in the Bombay Presidency :—

'That this Conference is of opinion that Government be requested to consider the advisability of introducing the Egyptian system of cotton markets in this Presidency, an account of which is given by *Mr. Smart*, the Acting Director of Agriculture, in his paper just presented to the Conference, and that as Hubli is one of the important cotton trading centres in the Presidency, Government be further requested to ask the Dhárwár District Local Board and the Hubli Municipality to co-operate in establishing such a market at Hubli, as an experimental measure, with a view to benefit the cultivators in the Dhárwár District.'

I come from the Dhárwár District, which is really a cotton-producing district, and so I would lay before the Conference what I know of the system which

prevails in the Hubli market now. As one of the cotton-growing cultivators of the Dhárwár District, I beg to lay before the Conference my personal experiences as regards the disadvantages, which the cultivator suffers in the disposal of his cotton produce locally as well as in the Hubli market. It is admitted on all sides that it is quite essential that a cultivator should have facilities, not only to grow the best and the most material, but also facilities to sell the same to his best advantage. The cultivator is very thankful to the Agricultural Department for the right and kind help they are rendering him to increase the quality and quantity of the yield by the supply of pure seed, and improved implements, and by suggesting various methods of preparing different kinds of manure.

But he will be much more thankful if the Department would kindly assist him in selling his produce, especially the cotton goods, with as little loss to him as possible, which, he believes, would be effected by the introduction of the Egyptian system of cotton markets.

The difficulties and the disadvantages which a cultivator has to face, at present, in the disposal of his cotton are as follows:—

After his cotton is picked and collected, in the majority of cases, the individual cultivator tries to sell his cotton locally. But owing to many objectionable practices, chief of which are false balance, rough and irregular (though not false) weights, and his inability to get his price money just when he wants it for the payment of Government assessment, his local purchaser has to depend upon the Hubli Dalál for the supply of his money.

It will not be irrelevant here, if I refer to the tricks that are practised by the local purchasers of the cultivator's cotton, an account of which is given in the fourth issue of the Kánarese Agricultural Magazine, published under the auspices of the Dhárwár Agricultural Association of this year at pages 85 and 86. In order to escape these local inconveniences and with a hope that he would get his cotton price immediately, the cultivator makes up his mind to take his cotton to the Hubli market, but, alas! Gentlemen, there he finds that he has escaped from Scylla to fall into Charibdis. His first difficulty is in securing waggon accommodation for his bales, for which he has to wait for days together, owing to which sometimes he has to lose the high rate he hoped to get at the Hubli market, and he has also to suffer in consequence of the waste and exposure caused by the lying of the bales on the Railway platforms.

After the bales are booked and received by his Dalál, through the Hundekari at Hubli, they are then taken to the cotton market, where, as in the case of the Railway, the goods are allowed to lie in an unsheltered place, as many of the Daláls have not got sufficient godown accommodation to accommodate all the cotton they receive from their principals, although they tax their principals with 'Wakhar' and insurance charges.

The next step, gentlemen, is to find out information regarding the correct and latest prices, to show which there is nothing similar to the Prices Board in the Egyptian system, and the cultivator has, therefore, to depend upon the buyer, who is often unscrupulous, as Mr. Smart aptly remarks. Of course, the cultivator has got his Dalál, who is supposed to assist him in securing the highest prices for his cotton, but, as I understand, under the existing practice, in the Hubli cotton market, the Dalál gets commission both from the purchaser and the seller, and it is quite natural that he would not protect the interests of the poor cultivator-seller as much as he ought to.

Mr. Smart remarks in his paper that owing to his ignorance and illiteracy the cultivator is deceived as to the real market rates, but it is my personal experience that owing to the want of proper means to ascertain the latest market rates, and as the purchasers generally combine in fixing the market rates, even a literate cultivator has either to submit to the sweet will of the buyer in the matter of rates, weighments and the Bardan discount, or to take his bales back home if he is dissatisfied with the above, which course is, I think, quite impracticable. By the way I may be allowed to mention another practice obtaining in the Hubli market, which is detrimental to the cultivator-seller. It is generally declared that the rates are so many rupees per Nága, *i. e.*, four bales. It is not

clearly stated whether these rates include the price of four baggings that cover the one Nága of cotton, but while the cotton is weighed along with the bagging, they deduct that weight of the bagging, which is generally arbitrary and varies according to the will of each individual buyer.

Supposing the rates per Nága include the price of the bagging also, there is no earthly reason why they should deduct the weights of the bagging, but if the rates do not include the prices of the baggings, they may deduct the weights of the baggings and return them to the sellers. But instead of doing this they deduct the weights of the baggings in the gross weight of each bale appropriate the baggings to themselves free of cost, which is quite objectionable.

Many illiterate cultivators do not understand this, and even though some intelligent sellers know this, yet as it is the prevailing practice of the market, and as every buyer does the same, they have no help.

Again in the matter of weightment and measurement, the astute buyer finds many a loophole for trickery, as Mr. Smart rightly remarks:—

The cultivator, according to his local weight, puts full 13 maunds of kapás in each bagging, calculating that four bales would make one Nága, but, after it is weighed by the buyer in the Hubli market, he is astonished to find that it is shown to weigh only 10 to 10½ maunds in the Patti supplied to him by his Dalál, and the Dalál is ready with his explanation that this difference is due to the variation between the local and the English weights, the weightment in the Hubli market being made by means of the latter. Thus the cultivator is pitilessly mulcted of his two to two and a half maunds of kapás and the price of the four baggings. Even the Dalál, who is expected to protect the interest of the cultivator, feathers his nest at the cost of the poor cultivator. It is already stated how the cultivator is tricked out by the buyer and the Dalál in the matter of weightment. It is the practice of the Daláls in the Hubli market to take out about 1 lb. of kapás from each bale by way of sample, and if the bargain is settled this sample kapás, instead of being restored to the bale, goes to the Dalál's stock. In this way every Dalál makes an illegitimate, if not dishonest, profit of hundreds of rupees. In addition to this there is also a deduction of 2 lbs. called sample deduction in the gross weight of each bale. I have already referred to the practice of Daláls about the 'Wákhár' and insurance charges on their sellers. Besides these charges the Dalál charges the cultivator deductions for religious and Panjrapole institutions, though nobody knows where they exist and how and by whom they are managed. It is curious to note that the buyer, who, for the same reason as the seller, is equally bound, pays neither of these charges. In fact, the cultivator finds that almost 1/4th of the stock he takes to the market is eaten up by the above said charges and extortionate practices of the market.

Now in order to avoid all this unnecessary loss and trouble the cultivator prefers to sell the crop before it is picked, as is observed by Mr. Smart, generally to his great disadvantage, the result being that he is not able to reap the fruit of his labour to the fullest extent, simply owing to the want of proper market facilities.

It is for these reasons, gentlemen, I, as one of the cultivators, earnestly beg to urge the Conference to consider the advisability of adopting my resolution.

Mr. Purshotamdás Thákurdás:—Gentlemen, I would like to make a few observations on the Sub-Committee's recommendations. Will Mr. Smart kindly tell me whether the cotton sold at the markets in Egypt is seed cotton.

Mr. Smart:—Seed cotton.

Mr. Purshotamdás:—Is the seed cotton ginned after it is put in the market?

Mr. Smart:—It is ginned afterwards.

Mr. Purshotamdás:—Do I understand this is seed cotton?

Mr. Smart:—Yes.

Sardár Chunilál :—We deal with cultivators and the cultivators deal with seed cotton.

Mr. Purshotamdás :—(After thanking Mr. Smart for his courteous reply) I beg to observe that I happen to be one of the buyers of cotton in big centres in the Bombay Presidency as well as in other parts of India. I happen to know about the ginning factories in about two dozen places, and I am, therefore, not able to endorse the bitter complaints made by the speakers, who have produced their papers. I wish to say that they must not be taken as a general rule. I am acquainted with several instances in which the ryots have tried to do the buyers in the eye. (Laughter.) I am prepared to admit there are a few instances of the conditions which we are discussing. With regard to Mr. Smart's paper, one of his suggestions is to introduce a system of giving daily prices for the upcountry markets. I am not aware of how many varieties are grown in Egypt, but in Bombay the varieties are many and differ greatly in price. I may here observe, I am not standing to say a word for or against the recommendations of the Sub-Committee. I only wish to point out to this Conference some of the difficulties which, I find, the cotton market people may have to deal with. So far as these quotations are concerned, I am afraid, they will have to be very carefully scrutinised. The object of the quotations we are dealing with is to give the cultivators a correct idea of the price of their cotton in a particular market on a particular day. This is a very delicate subject to deal with, and for that purpose the District Local Boards would have to employ men, who must be disinterested in assessing cotton. Then the next question before the Conference is about stocking cotton. It is said by Mr. Smart that cotton must be brought to the market. In the Bombay Presidency, I know myself wherever there are 4 or 5 ginning factories, the cotton goes straight to the gins and is sold there, and cash is paid by the buyers. The ginning factories are working night and day, and I don't think it would be possible to handle cotton on arrival every day in the way recommended. The number of weighing machines required would be very large, and I think that correct weights if kept to check those used by private owners, as is done at present at some cotton centres would be sufficient. Those are the difficulties which will have to be considered by the cotton market people. Again I understand that the balance of cotton belonging to a merchant is not to be kept in the cotton market more than 48 hours.

Mr. Smart :—They are not bound to remove their balances or stocks but they have to pay demurrage.

Mr. Purshotamdás :—If you wish to stock cotton there until it is ginned, there must be bigger godowns. I don't think such removal is possible when the season is busy, and the charges would be prohibitive. Then I come to the next question. The gin owner is hardly ever concerned with the buyer. In the majority of cases there are middle men. The ginning companies have sometimes their head offices in Bombay. It is rarely to the interest of gin owners to keep false scales. I do admit that the scales are sometimes wrong to the extent of 4 to 5 maunds. With these observations I beg to submit that cotton markets, on lines marked out by Mr. Smart, can do very useful work on other lines, and one of the other lines would be to prevent frauds regarding false scales. The remedy is to get standard weights stamped by Government, and in case a buyer or seller has a suspicion that the weights in the ginning factory are wrong, he can go straightway and get the wrong weights checked with the standard weights. That is how the thing is done in the Cotton Green at Colába. There we have half a dozen standard weights renewed every six months. I don't think this would be found feasible in the busiest season for the District Local Boards to manage. Large ginning factories weigh their own cotton, and in case a private seller disputes the weight, that should be compared with the standard weights. This is one of the lines in which the cotton markets, that Mr. Smart proposes, may work. The other thing that these cotton markets can do, is to keep statistics about the arrival of 'Kapás', and the export of cotton. This would remove one of the greatest difficulties between the sellers and the consumers. At present people cannot get right statistics of the growth of cotton. This information is necessary for the purpose of the Pressing and Ginning

Factories. As to the third question of cotton quotations, I venture to think that both the middlemen and cultivators in the Districts are getting more and more intelligent day by day. Everyone knows you have a certain number of examples of deceit, but, on an average, the intelligence of cultivators is going up, and I do not think he will sell off his crop before its time, before it should be sold off and before it is fit to be sold off, as he used to do 50 years back. The question of selling Kapás to the Bunia before it was grown at a very low rate does not now arise. That is my own experience. I beg to say this with regard to the recommendation No. 1, that I don't see any reason to object to the Commission calling upon the Agriculturists to give evidence as regards weights and measures. Both the merchants and agriculturists ought to give evidence about weights and measures. As regards recommendation No. 2 there are three difficulties that I mentioned. With these observations as to how these cotton markets should be utilised, I shall wind up by only saying this, that the idea of having cotton markets, has been carried out in Káthiáwár within the last ten years, and at Wadhván, Morvi and Limdi there have been cotton markets. They charge per bale of cotton 2 annas or 3 annas; that goes to the ginning factory. Officers go to the ginning factories and stamp cotton bales. In case of disputes of weights, reference is made to the standard weights that are kept there. Beyond this I don't think the cotton markets have done anything else advantageous to the cultivators. I don't think Government and Local Boards can handle cotton in factories in busy seasons. They may be able to increase their income by levying a cess.

Mr. Smart:—Mr. Chairman and gentlemen, it is rather difficult for me to reply to the remarks of an expert like Mr. Purshotamdas Thakurdas, on a subject like this. But I would make few remarks. Mr. Purshotamdas's experience is mainly confined to the Surat District; it is one of the districts in the Presidency where there is no necessity for protecting the cultivators. My friend, Mr. Bhimbháí, will tell you that the Surat cultivators are very well able to take care of themselves. My paper does not advocate the establishment of markets as a general rule, applicable necessarily to that part of the country from which Mr. Purshotamdas comes. From other parts of the country I have received reports which, I think, are perfectly reliable, as to there being considerable malpractices in cotton markets both as to the weights and exactions taken from the cultivators. There are many kinds of exactions in other parts of the country. I don't think that the Surat cultivators would put up with them. I have no desire that all cotton, which comes within the Municipal limits, should be subjected to these cotton market rules; it is perfectly open to any cultivator to go anywhere he pleases and have his cotton weighed there. In Egypt the system, to which Mr. Purshotamdas refers, is in force. It is perfectly open to the cultivator to get his cotton weighed in one place and then have the weightment checked on the official machines. In a big town, where there is a great deal of cotton to deal with, let them set up one small market, to start with, as an experiment to see whether they get a demand from the cultivators. With regard to Mr. Purshotamdas's remarks, which he has made about the first recommendation, I may say that the Sub-Committee desired that the Commission should not hear only traders and cultivators who have trading interests. They wished that the Commission should take the evidence also of cultivators who have no connection whatsoever with trade. That was the idea of the first resolution.

Mr. Purshotamdas:—When I spoke for the first time, I had no mind of speaking of my experience in Surat alone. I am buying cotton in different places like Berár, Khándesh, Káthiáwád and the Bengal Presidency. The only part of India where I am not buying is Madras, Dhárwár and one or two other places. As to the Pinjrapole Cess, I perfectly agree with what Mr. Smart observes. But I may say there is such a Cess at Surat, Berárs, Khándesh and also at Broach and Káthiáwád. I would much rather see the cess diverted to much more useful institutions, but I am not prepared to see this charitable cess disappear altogether, because if a charitable cess once disappears, it will never be allowed to be saddled again; it would be lost for ever. Mr. Smart should try to divert the cess to a more apt subject. If you lose the charity cess, I am afraid, the trade will never allow it to be put on; if people find this

cess is unpopular, they can say "we won't allow you to put this cess on". I don't think this is a question in which anybody else can interfere. It is a matter of unity. As to what Mr. Smart says on the subject of scales, in case a man sees that the weight of a particular bale is incorrect, that bale should be taken to the standard weight. I don't think any additional cess would be justified.

Mr. Smart :—It is not compulsory. If a cultivator wants to weigh the bale on the Government scale, he can do it. To avoid having to weigh the bale twice over, he would find it probably cheaper to go to the Government scale at once.

Mr. Purshotamdas :—On a private scale he has not to pay anything.

Mr. Bhimbhai :—Gentlemen, there are certain facts to prove that merchants play mischief. I have seen this myself in East Khándesh and at Jalgaon. If once people learn the advantage of the system of cotton markets, they would take their cotton there. As far as I can see, the whole business requires that cultivators should get the cotton markets within the control of the Local Boards or Municipalities. Then as regards the quotation of rates, my own experience shows that it would benefit the cultivators without any doubt. The publication of rates would do a lot of good to the cultivators. With regard to what Mr. Purshotamdas Thakurdas has said, I do not see why the whole resolution, as it stands, should not be passed. The scheme is necessary for other parts of the country than Surat, and I leave the whole thing to the judgment of the Conference to pass the resolution, as it is, unanimously.

Ráo Sáheb M. L. Kulkarni :—With regard to Mr. Purshotamdas Thakurdas's remarks, I have got experience of many ginowners and I have got examples of many ginowners as buyers. They get cotton always from the cultivators, when the market is not good and the rates are not high. As regards the question of weighment, the experience of all the cultivators in the Southern Maratha Country, *i. e.* in Hubli, Dhárwár and Gagad, is that when the cultivators actually weigh cotton in their own houses and send it to the cotton market and again weigh it there, they find it weighing less. I have seen cotton weighing 30 lbs. to afterwards actually weigh 7 lbs. The cultivators have learnt this and many of them have left off going to the local Daláls. As regards prices, my experience is that the Local Boards will not be able to control the buyers. As regards weighment, that must be left to be managed by Local Bodies, who are not interested in the business. Weighing and other management may be done by the Municipalities and by Local Bodies, and buying may be done by the Bombay merchants.

The Honourable Ráo Bahádur S. K. Rodda :—I will speak only one word about the "Charity tax". The "Charity tax" is always recovered from the poor ryots. But it is used by the rich buyers (laughter), so the object of charity is not won. The buyers pay nothing for charity, but they prosper at the cost of the poor ryots. Generally speaking, such charity funds would be a boon to the agriculturists, but on the other hand, I am afraid, these poor people pay for the comfort and convenience of the rich buyers of cotton. As to Mr. Purshotamdas Thakurdas's idea about the disappearance of charity funds, I fully agree with him that once the charity tax is gone, it can never be revived. The sooner it is abolished, if not existing for the benefit of the poor ryots, the better it is for the good of the agriculturists.

The President :—Gentlemen, I am inclined to suggest that the wording of this resolution might be slightly modified. You say "Government be asked". Well, Government has no information as to the exact course to be pursued, and I do not understand exactly what the procedure would be. I suggest to you that it would be better to say that Government should be asked to take steps to secure that the evidence of pure agriculturists shall be placed before the Commission.

Mr. Smart :—I accept the modification.

The President :—Then as regards the other part of the resolution, I am not sanguine that Government would accept your recommendation that the Municipalities and District Local Boards should be empowered to do so and so.

I don't know, at present, whether there is already existing such a power. I think, if we intend to start these cotton markets, we shall have to examine somewhat more closely what the functions of the Municipalities and the District Local Boards would be. I suggest that instead of committing ourselves absolutely to a definite and a certain course of action, we should say in the resolution that "Government should be asked to examine the question of empowering the Municipalities, etc." Instead of forwarding a recommendation "to do something," we should ask Government to examine the question to find out if it is practicable. That is what we can do (Cheers).

Mr. Smart :—On behalf of the Sub-Committee I think I may say that all its members will agree to the modifications recommended and that they may be accepted by the conference.

The President :—Gentlemen, the resolution that is now before the Conference is this :—

1. That the Government should be asked to take steps to secure the evidence of persons representing purely agricultural, as distinct from trading, interests before the Commission of Weights and Measures.

2. That the Government be asked to examine the question of empowering Municipalities and District Local Boards to establish cotton markets and markets for other agricultural produce, such as "gul", on commercial lines, similar to those established lately in Egypt.

The resolution was put to the Conference and carried unanimously.

Recommendations of the Sub-Committee on the Development of Co-operation in Agriculture.

Mr. J. A. Saldána, B.A., LL.B., Sub-Judge of Kumpta, referring to the recommendations on the development of co-operation in agriculture, spoke thus :—

Mr. President and gentlemen, I would like to throw out one or two suggestions on this resolution. I have some experience of this sort of co-operation. I beg to move no amendment, but simply to make a suggestion or two from my own experience. The existing libraries and such other institutions, which co-operate with the Agricultural Associations, may be placed at the disposal of the members of the Associations, so that they can read books on agriculture, agricultural co-operation, development of agricultural implements and other matters. Secondly, the Agricultural Associations should try to provide museums of agricultural products and implements. That has been actually done, to a small extent at Kumta, in connection with the libraries, which are existing there for a very long time. A museum was started after the last show; we have rescued what was possible from the Government show. We have kept them in a cupboard and they serve a very useful purpose. A fund has been left in the hands of Ráo Sáheb Pandit.

Mr. Eubank, Registrar of the Co-operative Credit Societies :—I call *Mr. Saldanha* to order, for he is referring to a subject which is not under discussion.

Mr. Saldána sat down.

Mr. S. N. Keshawain of Sirsi :—*Mr. Chirman and gentlemen*, *Mr. Gonehalli* has presented to the conference a paper on co-operation in agriculture. Let me admit my sympathy for and approval of it. I hope that the various suggestions made by him will meet with the entire approval of this conference. There is little doubt that co-operation in agriculture, if developed, will confer a great boon on the cultivators, and I venture to suggest to the gentlemen, attending this conference, that they should throw their heart and soul into this Co-operative movement and start Co-operative Credit Societies wherever possible.

Mr. Smart :—*Mr. Chairman and gentlemen*, I think the recommendations of this Sub-Committee are very admirable, and, I believe they have met with the approval of the Registrar and commend themselves to the conference. I propose that the recommendations of the Sub-Committee be approved.

A gentleman :—I have great pleasure in seconding the proposal.

The President :—I may say that at the present time the connection of the Agricultural Department with co-operation is more effective than it has been before. I think you will accept the application of the co-operative movement to the various objects which are mentioned in these recommendations. The result cannot but be productive of great good (Cheers).

The resolution was then carried unanimously.

The President :—Gentlemen, there are one or two resolutions which are still to be disposed of and which are not in print.

Mr. Maráthe of Belgaum wishes to move "that this Conference, while expressing its gratitude for the efforts which the Government have made during recent years for the improvement and advancement of agriculture, humbly begs to request that the Government of Bombay will be pleased to appoint a body of experts to make a detailed agricultural survey of the Presidency and to prepare a chart showing the soils, the climatic conditions, the present products, and the potentialities of different areas."

Resolution moved by Mr. Maráthe of Belgaum as to an Agricultural Survey.

Mr. Maráthe :—Gentlemen, I must thank the Honourable President for the permission he gave me to move this resolution. The resolution that I have got to move was read to you, but I again repeat it, so that you may understand its whole drift. It runs as follows :—

"That this Conference, while expressing its gratitude for the efforts which the Government has made during recent years for the improvement and advancement of agriculture, humbly begs to request that the Government of Bombay will be pleased to appoint a body of experts to make a detailed agricultural survey of the Presidency and to prepare a chart showing the soils, the climatic conditions, the products, and the potentialities of the different areas."

Gentlemen, the importance of this question has been realised by all persons that have thought over the agricultural problem in India. The importance of it has also been recognised by the Government of India, who have embodied the fact in their resolution of 1881, which was made on the completion of the Famine Commission in 1880. That shows that they had recognised the necessity of an agricultural enquiry, and the agricultural enquiry that was taken in hand not only resulted in the collection of information that was useful in combating famine, but also useful in the matter of the last Settlement or Survey of Rates. After the first year's enquiry Dr. Voelcker was sent here by the Secretary of State for India to make a report. He has written an admirable report on the question of agriculture. In that report he says that for the improvement of agriculture in India there is a necessity for an agricultural survey, and that without such a survey any attempt at agricultural improvements would not succeed. The principle of this resolution has already been accepted by Government, and we are now asking them to take some other measures in hand at an early date in the same direction. The agricultural survey should guide us on the following items :—

1. Nature of the soils.
2. Climatic and other conditions.
3. Facilities for manuring.
4. Facilities for watering.
5. Facilities for irrigation.
6. Facilities for sub-soil water and similar other conditions.
7. A survey of the products, that are already growing at different places and of the present and future potentialities of crops that might be produceable on particular areas.
8. A chart should be prepared on those lines on which charts are prepared for famines. There is a Statistical Atlas of the Bombay Presidency made in 1906 and it has an introduction. From the introduction mentioned above it

appears that the present agricultural area cannot be extended and made more productive, because it has practically been exhausted. The figures would show that the highest limit for the extension of agriculture has been reached. Now, better cultivation can only be done after gaining the knowledge of the various conditions of different places. The necessity for the agricultural survey has also been recognised by persons who have been taught in the Agricultural College itself. The other day I read in the Magazine of the Agricultural College a report showing that this question was discussed at one of the College gatherings. One of the graduates there said that though the graduates had got a mere theoretical knowledge of agriculture, they had no means of applying that knowledge for practical purposes, that an agricultural survey was, therefore, necessary and that they were at sea without it, for they could do nothing to benefit the cultivators. The agricultural survey is the groundwork for agricultural improvements, and for this reason I beg to place this proposition before you for your acceptance.

Mr. D. N. Desai:—Mr. President and gentlemen,—I just wish to express my idea about this proposition. I see this proposition is of no utility to the farmer. The indigenous farmer knows full well what soil is suitable for what crop. This sort of prospective survey is necessary only in the case of outside capitalists. They will be quite willing to take advantage of such a survey and dispossess the actual farmers of their areas. So, gentlemen, I would ask you to pause before accepting the resolution and giving support to this idea. I have nothing more to say.

A gentleman:—I beg to second the proposal.

The Honourable Ráo Bahádur S. K. Rodda:—Mr. President and gentlemen,—Mr. Desai has brought forward an objection to the resolution moved by Mr. Maráthe. The objection is one which, I hope, will not commend itself to the members of this Conference. His fear is that a survey of agriculture will induce or tempt capitalists of the country to come forward and till the ryots' lands. I do not understand how the survey will enable the capitalists to dispossess poor cultivators of their lands. If the capitalists come forward they will put the country under a great obligation. If the circumstances of particular places are such—if there are large tracts of the country which can be well cultivated, capitalists would naturally come forward, increase the cultivated areas and add to the material prosperity and wealth of the country. Therefore, I don't in the least see how the poor peasants will suffer from the agricultural survey. I suppose the map or chart, mentioned in the resolution, will show us the state of the country, the climatic conditions, the rainfall, the cultivable and uncultivable areas, etc. It will be a guide to the cultivators to give up uncultivable areas and go to those areas that are arable, and devote their energies there. We must thank Government for what they are doing in the matter of agricultural improvements, and urge on them to make a survey of the necessity of which there is no doubt. The objection of Mr. Desai is unintelligible and will not appeal to any member of this Conference. I am sure the Conference will accept this resolution with a unanimous voice.

Sardár Motilál Chunilál:—Mr. President and gentlemen,—as regards the view just expressed as to the capitalists coming forward from other districts, I will say this, that in the Land Revenue Code there is a provision that a person, who is in occupation of any land, as long as he pays the Land Revenue, cannot be touched by anybody. The law does not allow any disturbance with that man's right of occupancy even at the hands of a Government officer, unless there is a case of failure of payment of Government dues. How is it possible for any outside capitalist to oust the person who has been in possession of land for years and generations? The only fear that is expressed is groundless. Simply by listening to such groundless fears you may be tempted to undervalue the utility of the resolution that has been brought forward.

Mr. Púregaonkar:—I beg to support the original resolution brought forward by Mr. Maráthe.

A gentleman:—The charts should be so made as to be useful in guiding the cultivators in the direction of water-levels. Whether irrigation by wells is feasible should be found out by experts.

The President :—Gentlemen, I am inclined to suggest a modification to this resolution very much the same as I suggested as to the resolution regarding cotton markets. You should not ask Government to undertake what appears to be a very large order. It seems to me that the appointment of a body of experts to make detailed surveys must mean an immense labour. I cannot ask the Conference to ask Government straight away to take up such an undertaking. I am not sure that we shall be able to accept your proposal. I am perfectly willing to examine it. I understand that the Director of Agriculture, Mr. Smart, has already discussed the point with at least one of his staff, and it is possible that in the course of a further discussion we may be able to see how to make such a survey, but, at the present moment, I don't see that we can undertake such a survey. I don't think the Government would undertake the survey and appoint experts. I would, therefore, suggest to Mr. Maráthe to modify the resolution so as to make it read as follows :—

“The Government of Bombay would be pleased to examine the question of making a detailed agricultural survey, etc.”

That recommendation would be more likely to receive the consideration of the Government than a definite request at once to proceed to appoint experts.

Mr. Maráthe :—I would be very glad to accept the suggestion of the Honourable President, but, at the same time, I do say this, that we have got a survey of the ground, we have got a survey in the matter of famine conditions, and we have got a survey for revenue purposes. The things which I have suggested could be first ascertained from the Mámálatdárs of different tálukas, say, in particular places, for particular crops—all these things can be done with a little expense. Some expenditure will be necessary to examine the reports sent in by different Mámálatdárs, but that expenditure would be worth the trouble. But, I accept the suggestion made by the Honourable President and I would suggest to put these remarks in the resolution.

Mr. Smart :—The original proposals should be modified considerably. It is perfectly true that in the existing records we have a large mass of material available. An agricultural survey of a certain kind would be possible without much expenditure and the resolution might be a very useful one. But, if you are going to engage a body of experts to survey the whole country and examine the soil, etc., then such a survey will take at least 20 years to complete. I think the Chairman said this is a matter which would require very great consideration by Government before they undertake it. I think Mr. Maráthe will be better advised if he confines the resolution to the recommendation to Government that an agricultural survey should be undertaken and leaves it to Government to limit the scope of that survey.

The President :—Mr. Maráthe, in consultation with the Director of Agriculture, accepts the suggestion I made and is willing that the resolution should stand as follows :—

“That this Conference, while expressing its gratitude for the efforts which Government has made during recent years, for the improvement and advancement of agriculture, humbly begs to request that the Government of Bombay will be pleased to examine the question of making a detailed agricultural survey of the Presidency.”

The resolution was put to the Conference and carried unanimously.

Second resolution moved by Mr. Maráthe as to gradual increase of Demonstrational Farms with Schools for Practical Agriculture attached.

The President :—Gentlemen, Mr. Maráthe puts another resolution before the Conference as follows :—

“The Conference also begs to recommend to Government that a detailed scheme be prepared for the gradual establishment of such experimental and demonstrational farms, either purely Government or aided, at various centres of the Presidency, as will not only advance the cause of agriculture, but serve as schools for practical education and training in agriculture for the boys of agriculturists.”

Gentlemen, we have got our scheme for the establishment of experimental and demonstrational farms.

Mr. Maráthe :—The last resolution that I had moved was only to make solid improvements in agriculture. The second resolution, which I am going to move now, is to make agricultural improvements well-known. The two resolutions only go to strengthen the hands of persons who are now making attempts to spread agricultural education. The question of practical agricultural education is becoming a serious one. The Educational Department has thrown off its shoulders the responsibility of agricultural education, and, therefore, that matter is reported in the Annual Report of the Department of Agriculture by Mr. Smart. He has given there the necessity of practical agricultural education. My request in this resolution is only that a scheme be prepared and tried to combine education with experimental and demonstrational farms in different areas throughout the whole Presidency. This scheme would provide that both the experimental and demonstrational farms should contain a small school for practical training on the lines of the vernacular school, now established in Poona. The vernacular school is established in the Agricultural College, Poona, only to be useful to the sons of the agriculturists who come from the Central Division. We know there are many students who are present there from other Divisions. The methods of agricultural operations are not applicable to the Poona District which are applicable to other districts. In my own district, we have got three different kinds of tracts. We have got one tract known as the Konkan Tract, the other is called the 'Transition Tract', and the third is named the 'Deshi Tract'. We have not only got these three different tracts, but we have also three different kinds of cultivation. What education would be useful to the students in one of these tracts would not be equally useful to the students in other parts of the country. So, the point I suggest in this resolution is, that such vernacular schools should be gradually opened. I do not ask Government to open schools in each and every portion of the agricultural area. I submit that the scheme may now be passed and that gradually its extension be made by establishing schools in different areas on the lines of short courses or on the lines of the vernacular schools like the vernacular school adjoining the Agricultural College at Poona. I am sure that this resolution will be accepted by you.

Mr. Smart :—Mr. Chairman and gentlemen,—with regard to Mr. Maráthe's proposal the first part of it appears to me to be covered already by the recommendations of the Sub-Committee as to the levying of an extra cess. My paper on which the recommendations of that Sub-Committee were based provides that each district should have a demonstrational farm.

I would suggest that the resolution should run as follows :—

"That this Conference thinks that the number of schools of agriculture in vernacular should be increased and should be conducted in connection with the demonstrational farms which may be established in future."

Mr. Maráthe :—I would accept the suggestion that has been made by Mr. Smart, and my resolution should be passed on that basis.

The President :—The resolution which Mr. Maráthe has accepted, at the suggestion of Mr. Smart, runs thus :—

"That this Conference desires that vernacular agricultural school should be established more widely and in connection with the demonstrational farms which may be started in future."

I put that resolution to the Conference.

The resolution was carried unanimously.

Resolution moved by Mr. D. N. Desai as to the introduction of Bee-keeping.

Mr. D. N. Desai :—Mr. President and gentlemen,—the resolution which I am going to move runs as follows :—

"That this Conference is of opinion that it is desirable to introduce Bee-keeping as a cottage industry subsidiary to agriculture wherever suit-

able in this Presidency; and that the Department of Agriculture should undertake experiments with a view to domesticating indigenous species and acclimatising exotic species."

Gentlemen, this resolution which I have brought forward is to add to this Presidency one cottage industry, which is very suitable to agriculturists wherever they take to it. All the stock of the honey that we now get from the jungles is produced through wild bees bred in jungles and collected by the people in the jungles. We cannot, therefore, depend on its purity. The so-called pure honey, which we are able to obtain, is not less than 8 annas a pound, while the best honey from England, can be had in the Bombay market only at 12 annas a pound. If our farmers take to producing garden honey, as is done in European countries and in America, it might be a sort of cottage industry. I don't know whether our indigenous wild bees can be tamed or other exotic varieties should be brought where the climate is suitable. I am not in a position to say anything on that point. I would suggest that this Conference would ask the Agricultural Department to undertake that experiment, and if the result is successful, many people of this Presidency might adopt that scheme. I hope, gentlemen, you will adopt this resolution unanimously.

Mr. S. D. Navaikar:—I beg to second the resolution.

The Honourable Ráo Bahádúr S. K. Rodda:—Mr. President and gentlemen, our farmhouses are in villages where our houses are close together. In European countries there are separate farmhouses, where these things can be done. Here we live close together, and there is no space between our houses for managing this business. It is not possible here, at present, unless we have special farmhouses; and that, I think, is not feasible. With these remarks I beg to oppose the resolution.

Mr. D. N. Desai:—I would like to answer the question raised by the Honourable Ráo Bahádúr Rodda. I say that, so far as the experiments at Pusa are concerned, I realise that one of the varieties or species, at least, is likely to be very successful here. That can be grown in this country successfully. I am sure if people undertake the industry they will be successful. I admit that people living in villages live in houses close together, but I don't think this would affect the matter so as to preclude the people from taking up the industry, at all. In Surat farmers could select garden lands for this purpose. We have to try and see how much extra labour is required and whether the exotic varieties will thrive here. Poor farmers cannot undertake the experiments on their own behalf, and so we have to ask Government to undertake the experiments in the interests of the poor farmers to see whether the venture is successful or not. That is an important question. We want to learn whether that can become successful or not, and it is, therefore, the duty of the Government to see whether certain things can be introduced here or not.

The President:—Gentlemen, Mr. Knight will give us some information on this question.

Mr. Knight, of the Agricultural College, Poona:—Mr. Chairman and gentlemen,—with regard to bees, we have two phases to the problem before us. The first refers to the introduction of bees and the second to the domestication of the indigenous varieties. Of the indigenous varieties, we have three, one of which can be domesticated; the other is so vicious as to render it absolutely impossible to tame it and the third one is too small and lays up too little honey to be economical.

The only place where bees can be domesticated is along the gháts. The difficulty is getting a continuous supply of honey, which is not obtainable in all the parts of India.

You little realise the tremendous amount of honey pastures which are required to supply one swarm of bees. From what I see there is a very little chance of domesticating native bees.

As regards the exotic varieties, some experiments are being made at Pusa, but so far I can state they are not very successful or promising, although I have not received the detailed results of the experiments. It is not a simple matter

to keep bees. All of these varieties require proper attention and proper time to manage them. They are much more difficult to manage than other live stock.

I can see not the slightest possibility of bee-keeping ever becoming a useful industry to agriculturists of this part of India.

Mr. Desai then withdrew his resolution.

ADDRESS BY THE PRESIDENT.

Well, gentlemen, there are no more resolutions placed in my hands to be put before the Conference. Therefore, I think, I may remark that the business of the Conference has almost come to an end, but before we part, I should like to congratulate those that have attended the Conference on the very useful work that has been done. I don't remember exactly what year the last Conference was held—1909?

Mr. Smart:—Yes.

The President:—During the four years that have elapsed since the last Conference, I think, there has been a growth of interest in agricultural work shown by the great attention that was paid to the propositions under discussion here. The work of the Agricultural Department itself has increased largely as is evident from Mr. Smart's review and the excellent papers that have been presented and discussed. The papers that were not discussed are understood to be very useful and good papers, and will have a proper place in the proceedings of the Conference. All the papers presented to the Conference covered a very wide range of subjects, and we have passed resolutions regarding four subjects, which were referred to the Sub-Committees, and it is to be hoped—I think it may be confidently expected—that important results will come from the further consideration which may be given to those subjects, as the result of the resolutions passed today. The questions, which were asked by the members of the Conference and which took a great deal of the time of the Director and officers of the Agricultural Department in answering on the first day of the meeting, also show the very intelligent interest that has been taken in the work of the department, and the creation of that interest is good in furthering the objects of the Agricultural Department. The last Conference certainly gave the Agricultural Department a fresh send-off in the advancement of its work, and, I think, this Conference will give it a fresh starting point for undertaking improvements in many directions. Perhaps, the most noticeable of these is that regarding cattle. His Excellency the Governor has started experiments of his own, taking only a small amount of assistance in the shape of the erection of some small cattle sheds at Government House. His Excellency's interest in the subject will have a very strong and healthy influence on matters which need great attention. It is really lamentable to see the want of attention that is to be observed in the rearing of cattle in the districts of the Deccan. In every district the condition of cattle is lamentable. It is lamentable to see the breeding, feeding, rearing and growing of cattle is misunderstood and neglected by the owners of cattle, to whom it ought to be of the greatest interest that the cattle should be well-kept, well-attended and well-fed. In order to effect improvement in cattle it is, I think, necessary to bring about improvements in the matter of fodder, and this is a matter in which the lack of interest taken by the agriculturists of the Deccan, and possibly also of elsewhere, is very lamentable. There is a necessity for educating and training agriculturists to induce them to grow and preserve and make use of fodder which is valuable for the purpose of enabling the agriculturists to keep their cattle better than they do now. There would be an advance in the diffusion of knowledge if the systematised methods of calling visitors to the College here—and possibly, later on, to Surat, and Dhárwár—were introduced and also by increasing the agricultural schools. A demand for them appears to have become persistent. It is no use putting up schools where there is inefficient education or where there is deficient education, but the schools should be provided where demonstrational and practical agricultural education can be given with advantage to the youths of the country. Also, I hope we shall

make progress in the matter of agricultural organization. A very fruitful initiative had been taken by the Director of Agriculture by talking to farmers and trying to organize unofficial bodies—a series of influential bodies—throughout the country, to assist him in securing the good of the agriculturists of the Presidency. I thank you very much for your deliberations, and I hope you will be profited just as much as I myself have been from listening to them. I hope you have been profited by what has taken place and also from the demonstrations. I am sorry I was not present at the College, yesterday morning, or at the Mánjri Farm this morning. I hope, when you go back to your districts or towns, that you will try to spread amongst all your fellow-citizens the ideas which you have been listening to here.

The Honourable Ráo Báhádur S. K. Rodda:—Gentlemen, on behalf of this Conference, composed as it is of representatives from one end of the Presidency to the other, I have the pleasant duty now of moving a proposition which requires no seconding. I am sure it will have the unanimous approval of one and all present here. And that pleasant proposition is to move a vote of thanks to our worthy Chairman, who, during the last two days, has presided over the deliberations of this august assembly interested in agriculture—in the welfare of an industry, which supports more than $\frac{3}{4}$ ths of the population of our Presidency. He has favoured us with assistance and advice in matters where we were apt to be laid astray. He has been kind enough to advise us on many points, and one remark, which he has made, especially deserves that we should bow to it and obey it as a rule. His advice was that all the talk that is now done here should not be allowed to vanish in the air, but that we must take it with us to our districts—all the knowledge we have gained here—and try to disseminate it among the cultivators that supply us with our daily food. Because, you must remember one thing that the old peasantry in the country, if once destroyed, can never be supplied again. This valuable point should be engraved on our hearts—the hearts of every citizen and of every well wisher of husbandry in the country. Therefore, it is our primary duty to work for the welfare of the people who are working for us. I again thank Sir Richard Lamb and the officers of the Agricultural Department, who have taken so much interest and have given us an opportunity of representing our views and of forming acquaintances and friendships among the members of the Conference and of working for the common cause. We are obliged to the officers of the Agricultural Department for the kindness they have shown in inviting us here.

Mr. Maráthe:—I have great pleasure in seconding the resolution moved by the Honourable Mr. Rodda. Our thanks are due to the Honourable Sir Richard Lamb for being present here from the very beginning.

The proposition was carried by acclamation.

The President:—Gentlemen, in acknowledging the vote of thanks which you so kindly passed I would like to add my own thanks to the Director and officers of the Agricultural Department, for the great trouble they have taken in assembling this Conference and in carrying out, in an extremely successful manner, the demonstrations, which took place yesterday and this morning.

The Conference was then dissolved.

APPENDICES.

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APPENDIX I.

No. ^A₇₅₉₃ OF 1913.

From

W. W. SMART, Esquire, I. C. S.,
Ag. Director of Agriculture, Bombay,
Poona ;

To

Poona, 21st August 1913.

Sir,

I have the honour to inform you that it is proposed to hold a Conference for the discussion of agricultural questions at Poona in the Council Hall on Monday, Tuesday and Wednesday, the 15th to 17th September, at which His Excellency the Governor has kindly consented to preside; and to invite you on behalf of the Managing Committee of the Conference to attend.

It is proposed to submit to the Conference for criticism and suggestions a summary of the work of the Agricultural Department since the Conference of 1909 and a copy of the same is attached together with a programme of the Conference and a list showing the subject matter of papers to be presented to it. If you will be so good as to inform me in advance of any matter on which you propose to address the meeting, or with regard to which you wish to ask for information, it will greatly facilitate matters.

It is hoped that printed copies of all the papers to be presented to the Conference will be posted to you ten days before the date fixed for the Conference.

I have the honour to be,

Sir,

Your most obedient servant,

W. W. SMART,
Ag. Director of Agriculture.

APPENDIX II.

PROGRAMME FOR THE AGRICULTURAL CONFERENCE APPROVED
BY THE MANAGING COMMITTEE.*Monday, September 15th.*

- General Meeting of the Conference at the Council Hall ... 12 to 4 o'clock.
1. Address by His Excellency the Governor.
 2. Presentation of papers before the Conference by their authors.
 3. Questions or comments arising out of the summary of the work of the Agricultural Department since the Conference of 1909.
 4. Appointment where necessary of sub-committees to consider and report on papers presented to the Conference.
 5. Questions or comments arising out of papers not referred to sub-committees.

Tuesday, September 16th.

- Visit to the Agricultural College and demonstration there of implements, boring machine, etc. ... 8-30 to 11 o'clock.
- Meeting of sub-committees at places appointed by the Chairmen ... 1-30 to 5 o'clock.
- Visit to the Ganeshkhind Botanical Gardens ... 5 to 7 o'clock.

Wednesday, September 17th.

- Demonstration of cane-crushers, furnaces, and implements for the cultivation of sugar-cane at the Manjri Farm ... 8 to 10 o'clock.
- General Meeting of the Conference at the Council Hall to consider and discuss the reports of sub-committees ... 2 to 5 o'clock.

Detailed programmes for the visits and demonstrations on 16th and 17th September will be given to gentlemen attending the Conference on 15th September.

Also a list of the publications of the Department and a copy of English leaflets published by it will be distributed; and vernacular copies can be obtained on application.

APPENDIX III.

SUMMARY OF THE WORK OF THE AGRICULTURAL DEPARTMENT
SINCE THE CONFERENCE OF 1909.

Your Excellency and Gentlemen,

I have attempted to sketch merely in outline the progress made since the last Conference with special reference to the resolutions passed thereat.

A detailed record of our work is to be found in the annual reports. For convenience of treatment I propose to review the progress made at the Agricultural College, at the Experimental Stations, in the districts and in the engineering branch separately, but in actual fact our educational and research work and our attempts to gain the ear of the cultivator and show him improved methods are inseparable.

The keystone of the reconstruction of the Department which was decided on in 1905 was the erection and equipment of a college from which the Department could derive a trained staff and at which land-holders in the Presidency could obtain a scientific and practical knowledge of agriculture.

It is due largely to the initiative of Lord Curzon that the College in Poona was planned on such a magnificent and comprehensive scale and Indian agriculture owes him a debt of gratitude for reawakening an interest in the occupation which is followed by about 70 per cent. of the population and on which the staple industry of this Presidency depends.

At the last Conference, the chemistry block alone had been occupied for 4 months, the new course for the University degree had been just begun and the students numbered 106. Now we can say that the main block has been occupied for 2 years, the hostel for the students during the present term, that the total number of students is 110 and the number of first year students is 43, the largest number on record. This year's Calendar gives an account of the number of B.Ags. since 1909 and the occupations in life which they have taken up. It shows that our Bachelors of Agriculture have no difficulty in finding a walk in life, and this year out of seventeen, four of our graduates have returned to their lands or have engaged in industries dependent on agriculture. Some difficulty has been experienced in filling vacancies in the Department and several estate owners cannot find graduates willing to accept the excellent appointments offered. Dr. Mann has 6 or 7 private appointments vacant.

The College does not confine itself to teaching men who wish to take the degree in Agriculture, but gives an identical course to students from Sind, other Provinces, Native States and Ceylon. There were as many as 7 students admitted in 1912 and 2 in the present year for the latter. Besides, there is a short course which was started in 1909-10 intended for the sons of farmers and land-owners. It lasts one year and the sole qualification is an adequate knowledge of English. Its popularity and usefulness is proved by the fact that the number of men taking it rose from 4 in 1909-10 to 15 in 1912-13 and the number is the same this year. I think that the wish expressed by the Honourable the Chief of Ichalkaranji at the last Conference that the wealthier land-lords should avail themselves of the teaching of the college has been fully realised.

The College also serves as a centre for activity in connection with agricultural improvement and the dissemination of agricultural information. The office of the Vernacular Agricultural Magazine in Maráthi the "Shetki and Shetkari" is in the College buildings. This monthly magazine which is published under the auspices of the Deccan Agricultural Association but edited at the college, has a monthly circulation of over 4,100 copies. The Magazine was started in 1910 as a result of discussion which took place at the last Conference. A similar magazine in Kánarese, published under the auspices of the Dharwar Agricultural Association but edited by the Divisional Inspector of Agriculture, S. D., Rao Saheb Kulkarni, to whom the credit of its continuance and success is chiefly due, supplies the cultivators of the Karnatak with valuable information on points of practical interest and improved methods. The College library which has received liberal grants from Government consists of nearly 6,000 volumes, as compared with 1,200 in 1909. It is consulted by gentlemen from all parts of the Presidency as well as by College students. The Agricultural Chemist Dr. Mann is consulted on all questions affecting soils, water, manure, feeding stuffs and other matters. The number of analyses made by him has increased from 1,192 in 1907-08 to nearly 1,700 in 1912-13. Mr. Burns, the Economic Botanist, receives numerous inquiries as to plant diseases, the purity of seeds, the management of gardens and fruit trees and the introduction of new varieties.

At the last Conference there was a general feeling that vernacular education in agriculture should be provided in some form to the sons of cultivators who did not know English. The Department accordingly opened a school at Poona in close connection with the college at which the sons of patils and substantial cultivators could be given a sound knowledge of the elementary principles underlying the art of farming and a thorough

manual training in the practice of improved methods of agriculture in the fields. I may say that at least half the working hours are spent in field work. The school was opened as an experiment and has proved successful as far as its popularity and the efficiency of the teaching imparted to the boys are concerned. Their careers in after-life will be observed to see whether they are successful in spreading a knowledge of and confidence in the improved methods which they have learnt.

The boys are admitted between the ages of 14 and 16 and must have passed the fourth Marathi standard; 35 boys joined in the first two years.

The experiment has excited great interest throughout the Presidency and appears to have met a genuine demand on the part of the cultivating classes. The Lingayat Education Fund Committee of Dhárwár offered a substantial school house to the Department for a similar school and a public spirited Lingayat gentleman, Mr. Chenbasappa P. Shetti, provided the necessary land. The school should have been opened in June, but owing to the delay in the building of the quarters for the masters and boys, the opening has been put off till January. The Head Master has received a thorough training at the school at Poona and will complete it on the Dhárwár Farm.

The building of a similar school is to be started this year in Gujarát and I have received offers of land for the purpose from two districts. At Alibág Sardár P. K. Biwalkar is building a vernacular agricultural school on similar lines and is training at his own expense a graduate who will become Head Master in November next. Another gentleman in the Thána district has offered 175 acres of land for the establishment and endowment of a similar school to benefit the farmers of his own and surrounding villages. These institutions therefore appear to meet a real want in many districts of the Presidency and though I would not advise their establishment everywhere, we must be prepared for a considerable extension in this direction.

The holding of classes for the instruction of cultivators in special subjects on certain farms has not been an unqualified success. They have not attracted quite the class of men we desired, but 15 men attended the class at Manjri for instruction in the cultivation of sugarcane and the preparation of raw sugar and 11 men attended the classes for dairying at the Kirkee Dairy this year. It is difficult to induce actual cultivators to leave their homes for even two or three weeks and reside on our farms. Consequently we have held demonstrations lasting two or three days to attract the cultivator. As many as 625 attended the demonstration on the Surat Farm in December 1912 and 80 specially selected men attended the 2 demonstrations held at Manjri in March last. In December 1912 Mr. Gonehalli, Extra Deputy Director of Agriculture, Konkan, took a party of 26 cultivators from the different districts of the Konkan on a tour lasting 4 days to the Bassein, Kelva-Mahim and Puna-Kumbharia gardens of Thána and Surat districts.

As to the work done at experimental stations I can give only a short account of the main lines of the experiments which are being carried out.

Excluding Sind where two stations and several sub-stations have been opened since the last Conference, new experimental stations in the Presidency have been started since 1909 at Alibág, Ratnágiri and Gadag in Dhárwár; sub-stations at Ahmednagar, Sisodra in Surat, Broach and Bori in Broach, Asláli in Ahmedábád, Kelgeri in Dhárwár, Bársi in Sholápur and Bhilawadi in Sátára. Also a large seed farm at Jalgaon and a grass farm at Tegur have been started.

At the time of the last Conference practically no work had been done in the Konkan, but in 1910 Mr. Gonehalli who had returned from Cambridge after taking his degree in Science and a Diploma of Agriculture was appointed as Divisional Inspector and a project to open an experimental station in the Kolába District to investigate the best method of maintaining and improving the fertility of rice lands was considered. The temporary appointment of Mr. Holmes-Smith in 1910 to this Presidency enabled the Department to take up the important work of classifying rices and his work has been continued on the Alibág Station which was opened in March 1911. It had been proved at Bassein that small varieties of groundnut could be grown successfully in the Konkan and the crop was taken up by cultivators in the Ratnágiri district with enthusiasm. As the Collector of the district remarked: "The Agricultural Department has succeeded in introducing into the district a commercial crop which can put money into the pockets of the cultivator." The problem as to the best method of growing groundnuts is being worked out on the Alibág farm.

The use of san herp and leguminous crops as green manure for rice has also been demonstrated, but the best time to sow the green manure crop so as to obtain the largest quantity without endangering the safety of the rice crop is under investigation.

At Ratnágiri a station has been opened this season to study the same problems on the laterite soil of the Southern Konkan. It is hoped that in the course of a few years we shall be able to recommend several more improvements in practice in the Konkan.

At Ahmednagar sub-station the problem of dry farming has been extended. The famine years which have occurred in the district were a test of the extent to which special methods of cultivation could mitigate the effects of scanty rainfall, and I think that it must

be admitted that in a season such as occurred last year no methods of tillage can produce a crop. There is a minimum rainfall which is necessary for any system and as our experiments have proved this, they must not be regarded as barren in their results. There is little doubt that conservation of moisture by scientific methods of tillage can increase the outturn of land situated in tracts of scanty rainfall. At Tegur the problem of cutting grass cheaply with a mower and storing it by different methods, and also of feeding and improving the local cattle has been taken in hand.

The work at the older stations has continued on the lines laid down several years ago. I can refer merely to some of the main results of our experiments over a long series of years.

Cotton is the most important commercial crop of this Presidency and upon it depends our chief industry. The Department therefore has spent much time and money on the improvement of varieties and methods of cultivation.

At Surat the experiments in growing hybrid cottons and selecting from the same have been continued for many years. The selected cottons were distributed first on a small scale in 1909-10 and the prices realised by the cultivators were 3 per cent. in advance of market rates. In 1910-11, 3000 acres were sown and bought by a local merchant at rates ranging from 4 to 7½ per cent. higher than those paid for local seed cotton. In 1911-12, a Syndicate of the Bombay Mill-owners provided a buying agency to purchase the cotton at 5 per cent. above current market rates for ordinary Surat cotton. Over 12,000 acres were sown in British and Baroda territories but owing to the very bad season only 1,167 bales instead of over 2,000 were obtained. The Syndicate were pleased with the cotton and made a fresh agreement for 1912-13, but I regret to state that though the Department got 16,000 acres sown and employed a special staff to superintend the growing, and the outturn and crop were excellent, the Syndicate, owing to disputes as to the market rates on which the 5 per cent. was to be paid, terminated their operations before the end of the season. This result is very unfortunate as it has not improved the relations between the Department and the cultivators or the Department and the trade in Bombay. I am not going to discuss this controversial subject further, but there is some consolation in the fact that local merchants came forward and gave good prices for the tail end of the crop and that the cultivators have purchased from the Department for this year's sowing enough seed to sow about 7,900 acres. We have informed them that we can make no promise to help them in disposing of the crop beyond certifying that it has been sown from farm seed. I believe that this will be sufficient to enable the cultivators to get a price considerably above that obtained for local cotton, and as they have taken so much of our seed in spite of the experience of last season, I take it that they have the same belief.

At Dhárwár farm experiments in importing Návsari seed have been carried on for several years and it was found that the yield and ginning percentage and colour were greatly superior to the local Kumpta cotton. Where early rains can be relied on the crop is a profitable one and this fact has been appreciated by the cultivators. At the auction held in 1911, 170 *nagas* of 1,344 lbs each were sold at prices ranging from Rs. 220 to 191 per *naga* as compared with Rs. 152-154 for Kumpta. In 1912, 443 *nagas* were sold at prices ranging from Rs. 203 to 170 as compared with Rs. 120 for Kumpta. In 1913, 595 *nagas* were sold at prices ranging from Rs. 200 to 161 as compared with Rs. 138 for Kumpta.

The result of the experiments in the importation of Broach cotton may therefore be considered a success.

As the results of our experiments it has been decided to confine the Dhárwár farm to experiments in Broach and Kumpta cottons and the Gadag farm to Cambodia and American cottons though trials of other cottons are carried out on a small scale. Cambodia cotton has been tested for several years on the Gadag farm in comparison with Dhárwár American which is grown in the neighbourhood. The yield was proved to be slightly higher and the ginning percentage at least 7 per cent. higher. Consequently in 1911 over 5,000 lbs. of seed were distributed and the prices obtained at the auction in 1912 ranged from Rs. 206 to 120 as compared with Rs. 140 for Dhárwár American. The season was one of drought and Cambodia did very well. Consequently there was a large demand for seed in 1912 and many cultivators obtained impure seed from local merchants. The season was a peculiar one, the rain falling within a few days and being followed by a prolonged spell of rainless weather. The effects on the crop of Cambodia were more severe than on Dhárwár American especially where the crop had received poor cultivation. However in some villages the crop did well and the cultivators purified the fields by uprooting plants of other varieties. It is hoped that better results will be obtained this season and that the check which the popularity of the cotton received will be made up, but it must be recognised that Cambodia cotton being very like Dhárwár American, is liable to be mixed with the latter and that unless the cultivators realise that such mixture will kill the demand of the trade, and consequently the good prices paid for it, the future of Cambodia cannot be assured.

This year on the Gadag farm a new line of work has been started to improve Dhárwár American cotton which is composed of two distinct varieties. The seed of these varieties

has been separated and tests of the yield of each will be continued to see whether the deterioration in yield and quality is not due largely to the mixture.

Trials of different cottons suitable for growth under irrigation from the numerous wells of North Gujarát have been in progress for several years on the Nadiád and Dohad farms. Cambodia seed from Madras has proved very successful and its success has struck the cultivators who wished us to issue 20,000 lbs. of the seed. As caution appeared to be necessary, 2,000 lbs. only were issued this year. In Khándesh the local cotton has been examined carefully and has been found to contain a mixture of some half a dozen types of very varying agricultural value. For the past four years samples of seed have been collected and sown on the Dhulia farm. As a result of the analysis it has been discovered that one type which forms only 47 per cent. of the present mixture is much superior both in yield and ginning percentage and that if sown pure would give an increased profit of from Rs. 3-9 to 6-6 per acre. As there are 1,300,000 acres annually under cotton in Khándesh, it should be possible to add half a crore annually to the wealth of the two districts, even taking the lower estimate of extra profit. The Department has therefore acquired this year an area of 200 acres near Jalgaon which is being sown with pure seed of the Roseum type, and by agreements with registered growers selected in the districts who undertake to keep their fields purified from other varieties and to get the cotton specially ginned and who will be supplied every year with seed from the Jalgaon farm, it is hoped that in time the whole cotton area of Khándesh will be sown with pure Roseum seed. If this result is attained—and with the co-operation of the educated class of land-holders, I believe that it can be—the Bombay Department of Agriculture will have done much to justify its existence.

At the Collège farm attempts are being made to establish strains of cotton suitable for the Deccan. So far the results of experiments seem to indicate that *Roseum cutchica* may be the best variety for general introduction. On the better types of black soil of the Deccan where the rainfall is good, Broach cottons show promise if well cultivated as a dry crop.

Comprehensive tests of the seed supply of certain districts which were carried out by Mr. G. D. Mehta showed that the cotton seed generally used by cultivators was very poor. Experiments carried out by Mr. Mehta for treating cotton seed so as to eliminate bad seed and further tests of the treated seed on a field scale on the Collège farm indicate that considerable improvement in the germination, vigour of growth, and consequently in the outturn, ginning percentage and quality of the cotton is possible.

Side by side with the improvement of cotton on our stations, other crops have been studied. It has been proved that groundnut can be grown profitably elsewhere than in the Deccan and that of foreign varieties large Japanese and Virginian are the best to grow under irrigation and Spanish peanut and small Japan as a dry crop; though the larger varieties may succeed as a dry crop in favoured soils. The growth of groundnut has spread into the Konkan, the Karnátak and Gujarát as the result of our experiments.

The experiments on tobacco have continued for many years at Nadiád but without any striking results except of a negative character. A promising variety of tobacco suitable for cigarettes appears to have been found but it is too early to decide on its merits at present.

Trials of different kinds of wheats have proceeded for some years on the Dohád, Dhulia, Dhárwár and Gadag farms and some promising varieties appear to have been discovered, but it is too early to recommend their adoption. The same remark applies to jowári and gram experiments.

Trials with different kinds of manures have proceeded on all our farms. The value of night soil and poudrette has been established at Surat and Gokák where its use was unknown or neglected. The use of safflower cake as a cheaper substitute for castor cake and of ammonium sulphate as a top dressing, has been proved to be profitable after trials conducted for many years at Mánjri. Safflower cake has been taken up readily by cultivators on the Mutha Canal and ammonium sulphate, imported by the Department to the value of Rs. 5,865 this year, was bought up immediately by cultivators chiefly in the Sátára district.

The value of deep tillage and the use of the iron plough on heavy black soil have been demonstrated on our farms for many years, and in some districts such as Sholápur, Sátára and Poona, the use of the iron plough has become popular. The trial of new ploughs continues on all our farms, and at the Collège farm Mr. Knight has made advance in the improvement of other implements and appliances and in a short time we hope to create a revolution in the indigenous implements. I will not specify the direction our improvements are taking. You will be able to see this for yourselves when you visit the college.

In the Southern Maratha Country and in Surat districts there are large tracts of land infested with deep rooted weeds. To eradicate them hand digging or a fallow for many years is necessary. These are costly expedients and rendered necessary only by the ineffectiveness of indigenous implements. When land has been allowed to get into a certain stage of dirtiness even iron implements drawn directly by bullocks are powerless. Hence the Department imported geared ploughs from France which are pulled backwards and forwards by a steel cable and can work land 16" to 18" deep.

The plough was tried successfully at Dhárwár and a demand for its use at Rs. 35 per acre has been met; it has been found to do as good work as hand digging and in addition greatly to benefit the land. It was however slow and costly, and taking advantage of the generosity of Sir Sassoon David the Department obtained a grant of Rs. 40,000 from the Trust fund, and has ordered a steam plough which will commence operations in November and will do the same or better work than the geared plough for Rs. 20 per acre. It is hoped that this and similar plants will be taken up commercially.

At the Ganeshkhind Botanical Gardens experiments in various methods of grafting mangoes, budding oranges, and in testing varieties of papaya and guavas have resulted in useful discoveries. The successful treatment of grape vine mildew by which disease has been reduced from 69 to 10 per cent. has been demonstrated in the Násik district where it has been adopted by intelligent vine growers.

At Mánjri the gul boiling furnace has been improved considerably during the last two years. The improved types of furnaces have been adapted to all systems of crushing in different localities. The multiple furnace which is the latest improvement is specially suitable for use with power crushers. It saves fully 50 per cent. of the fuel, two-thirds of the labour and nearly one-half of the time required in the case of the old type of furnace. The fuel saved has been found to be as valuable lb. for lb. as farm yard manure, if it is applied to sugarcane. The actual working of these furnaces will be demonstrated at Mánjri on Wednesday.

The Department has not neglected the important question of the improvement of stock and of fodder. Where the class of plough cattle is worst, it has been recognised that an improvement in the fodder supply is necessary before any steps are taken to raise the standard of stock by the distribution of bulls and the castration of animals not to be used as such. The results of experiments in the storage of fodder which have been carried out at the Dhárwár and Surat farms for some years may be summarised as follows:—

The round stack is superior to the rectangular, because the quantity accommodated per unit of roof surface is greater and theft is more difficult. Where white ants are feared, an effective platform on pillars 2 feet high measuring 21 by 11 feet and sufficient to hold 30,000 lbs. of fodder can be constructed for Rs. 35. Mud plastering has proved the best kind of covering for stacks, as a loss of less than 7 per cent. occurred as compared with 10 to 30 per cent. in the case of other methods. A stack of this type cost one rupee per thousand lbs. of fodder to build and cover. Mr. Main has calculated that even in a normal year in the Kaira district, where fodder is plentiful, 1,000 lbs. of fodder so stacked could be sold at a profit of one rupee in May or June 18 months after stacking.

It is too early to give any results of our operations at Tegur in the mowing and stacking of grass and the maintenance of cattle and their improvement by the use of good bulls, but the experience of last year tends to show that grass farms may be made profitable in certain tracts.

I have obtained full information of experiments carried out by the Military Department in the shredding of Karbi and its compression into highly pressed bales. The Department hopes to be able to set up a plant of its own for this purpose shortly.

The use of silage as a valuable fodder for cattle especially milch cows has been demonstrated at Surat and other farms, and we are erecting silos wherever we can on our stations.

Mr. Horn has written a paper on the use of prickly-pear and cotton seed hulls as fodder; so I will not say more on this subject. I am convinced however that the use of hulls for feeding as is done in America, would be of immense benefit to the cotton tracts of this Presidency. It would save the cultivator much money which he now wastes on the purchase of fodder and in buying new cattle every year before sowing. All that is wanted is the establishment of inexpensive machinery for dehulling and reducing the kernel to flour which could be sent for pressing to central factories.

In Gujarát the Civil Veterinary Department maintain the Northcote cattle farm at Chharodi, 2,251 acres in extent, where there are 485 head of cattle. Stud bulls are sold from the farm to Local Boards and private persons. At Surat the Agricultural Department maintain a fine herd of Kánkreji cattle chiefly for milk which is sold in Surat. At Poona Civil Dairy cows chiefly of Sindhi breed are kept for supplying milk to public institutions and some bulls for stud purposes are maintained for the improvement of local animals.

Since the last Conference the district staff of the Department has been increased and reorganised. In 1910 Mr. Gónhalli was appointed Divisional Inspector in the Konkaa and in 1912 Extra Deputy Director when Mr. Knight was relieved of district work in the Deccan and the districts of the Presidency were redistributed amongst Mr. Main, Mr. Gilbert and Mr. Gónhalli. Every district now has an agricultural overseer and under the guidance of the Divisional Inspectors and the Deputy Directors this staff is touring constantly, obtaining information of importance, giving advice, conducting demonstrations in the use of improved implements and in the steeping of jowári with copper sulphate

to prevent smut. Also they distribute artificial manures and improved and pure seed of all kinds and erect improved furnaces and demonstrate improved methods of gul boiling. The Department is now in a much better position than at the time of the last Conference to bring home to the cultivators improvements which have been found to be valuable on our farms. The increase of the staff has made it possible to carry out operations on a large scale such as I have referred to, *e. g.*, growth of improved cotton round Surat, of Broach cotton round Dhárwár, and the spraying of vines near Násik. They have distributed Italian potato seed in Belgaum, groundnut seed and implements throughout the Presidency, sugarcane sets free from red-rot disease in Gujarát, and have, as far as possible, endeavoured to supply the wants indicated at the last Conference. Whenever an Agricultural Association desired to hold a show, they have assisted its committee, sent exhibits, given demonstration and delivered lectures.

Liberal contributions have been made by the Department to such shows, and it is our policy to help and encourage agricultural associations in every way. Mr. Kogekar was lent to the Deccan Agricultural Association for several months, Ráo Sáheb Kulkarni acts as editor of the Kánárese journal, Dr. Mann, Mr. G. K. Ranade and Mr. V. G. Gokhale act as editors of the Maráthi Magazine, Mr. Swádi is helping the Belgaum Agricultural Association in the campaign against rice hoppers which the association have taken over from the Department this year. The important question of fodder storage which has been studied on several farms for some years was the subject of an interesting lecture by Mr. Main at the last annual meeting of the Deccan Agricultural Association. All our district officers are expected to be in close touch with the associations and to help them.

Perhaps the most interesting development of our activity in the districts is the engineering branch of the Department. At the last Conference this branch had just started operations and a somewhat rosy account of its achievements was given. The branch however was proved later to have made a bad start and much of the work done had to be undone by Mr. Musto who was lent to us by the Public Works Department. Mr. Musto soon overhauled and set up again pumping and cane crushing plants which had proved unsatisfactory. The administration of the Department was put in working order and the large suction gas plant for pumping water from the Bhima river at Nándgaon was established. The number of oil engines used by agriculturists has increased and the demand is growing. The great difficulty which besets their extended use is the ignorance of land holders and often of the so-called mechanics whom they employ. Trifling mistakes and inattention to ordinary details of working lead to the stoppage of engines at critical times. To do away with this difficulty we have bought machines and plant for setting up a workshop at the Agricultural College, where for a nominal fee prospective owners of pumping plants or their servants will be able to obtain a sound practical training in the working of engines and pumps, and where repairs will be carried out and spare parts kept in stock. It is hoped that the workshop will be ready by November and that it will be availed of freely by the agricultural community.

Well boring in Gujarát started in 1907 and the Cawnpore apparatus was introduced in 1908 and substituted for the old process with marked success. In 1911 the District Local Board, Kaira, took over the sets of this Department working in that district, and now the Board possesses a special branch under an Engineer of its own for boring. Mr. Musto obtained a Cyclone drill for the Board from America and it is now in use. In 1912 the boring in Gujarát was handed over by Mr. Main to Mr. Musto, and since his return to the Public Works Department Mr. Musto has invented a machine which is a great improvement over the Cawnpore apparatus and which has the great advantage of being able to bore equally well in soil as in rock. One of these machines has been erected at the Agricultural College and its working will be demonstrated on Tuesday. The Department has tested the machine thoroughly and intends to buy several for use not only in Gujarát but in the Deccan and Karnátak.

The post of Agricultural Engineer has been made permanent this year and Mr. Schutte has been appointed by the Secretary of State to the post. It is hoped that this branch of the Department will make rapid strides and be of real benefit to agriculture.

I must conclude this somewhat lengthy review though I am conscious that I may have omitted many details of interest, with an invitation to all present to make any criticisms or suggestions as to the work of the Department since the last Conference which any one may desire to bring forward.

W. W. SMART,

Acting Director of Agriculture, Bombay Presidency.

APPENDIX IV.

PROGRAMME OF DEMONSTRATIONS AT THE POONA
AGRICULTURAL COLLEGE FARM.

(Tuesday the 16th September 1913.)

(8-30 A.M. to 11 A.M.)

The visitors should leave their conveyances at the new experimental well on the long-approach-avenue.

1. They will there see pumps, the experimental well, and workshops which are being erected.

A few steps further towards the college a road leads off on the East which, if taken, will bring the visitor to the first section of the farm, which consists of the object lesson and demonstrational plots.

2. On the right side soon after entering the fields, will be seen the healthy and vigorous growths of various foreign varieties of groundnuts.

3. On the left will be seen the *varadi* types of cotton improved by seed selection.

4. Going towards the East, notice the peculiar mixture of groundnut and Broach cotton as compared with sesamum and Broach cotton.

5. Proceeding further to the East, attention will be drawn on the right to the interesting collection of all the crops and their varieties grown in the Bombay Presidency.

Do not pass without noticing the guinea grass to your right, growing luxuriantly even under the shade.

6. Continuing to the left, there will be demonstrated the method of preparation of prickly-pear for feeding. Notice the condition of bullocks that are fed on prickly-pear. Side by side with this, the bullock gear chaff cutter will be shown in working order. Examine the various kinds of dairy feeds that are exhibited here.

From the exhibition of cattle feeds, cross the left approach-drive by a path, where the demonstration of ploughs and other implements adapted for light soils will be seen in progress:—

1. Different kinds of ploughs will be seen working side by side. The ploughs that deserve your special attention are given below with their prices, makers and the agents through whom they can be had—

Name of the implement.	Price.	Name of the makers.	Agents in India.
CT ₁ Plough ...	Rs. a. p. 45 15 0	Ransomes, Sims and Jefferies, Ipswich, London.	Duncan Stratton and Company, Bombay.
Arlington Plough No. 29.	40 10 0	Belcher and Taylor, United States, America.	Greaves, Cotton and Company, Bombay.
Z. H. 9 (German Plough).	73 0 0	Rud. Sach, Leipzig, Germany...	Schlectendahl and Com- pany, Bombay.
Doe's Plough ...	20 0 0	Belcher and Taylor, United States, America.	Greaves, Cotton and Company, Bombay.
S. B. 7 (Light Rud. Sach) Plough.	27 0 0	Rud. Sach, Leipzig, Germany...	Schlectendahl and Com- pany, Bombay.

2. Proceed next to see the Disc harrows doing a variety of work. Three types of Disc harrows will be seen working. They are—

Name of the implement.	Price.	Name of the makers.	Agents in India.
a. Cotton King Disc harrow	Rs. 98	International Harvester Com- pany, United States, America	Macbeth Brothers, Bom- bay.
b. Cut away Disc harrow.	68	Montgomery Ward and Com- pany, United States, America.	Nil.
c. Climax Disc har- row.	61	Do. do. ...	Nil.

3. As you leave the above and turn to the North, you will see several types of efficient seed drills working side by side. The following is a list of these seed drills—

Name of the implement.	Price.			Name of the makers.	Agents in India.
	Rs.	a.	p.		
a. The Clipper hoe-drill.	56	1	0	Montgomery Ward and Company, United States, America.	Nil.
b. The Kentucky seed drill.	75	0	0	International Harvester Company, America.	Macbeth Bros, Bombay.
c. The Key-stone drill.	160	0	0	Do. ...	Do.
d. The Reliable corn drill.	50	6	0	Montgomery Ward and Company.	Nil.
e. The Climax corn and cotton drill.	49	5	0	Montgomery Ward and Company.	Nil.
f. The Planet Junior hand drill.	30	0	0	S. L. Allen and Company, Philadelphia, United States, America.	Clubwalla and Company, Bombay.
g. The hand dibbler.	3	0	0	Montgomery Ward and Company.	Nil.

In the same area the important work of levelling is demonstrated. Note the cheapness with which the levelling of the land is done by means of the scrapers.

4. Just to the North of this demonstration will be seen a long strip of 23 acres managed by the third year students of the college. In some of these plots the work of several kinds of improved interculturing implements worked by manual and animal labour is seen. These several types are given below—

Name of the implement.	Price.			Name of the makers.	Agents in India.
	Rs.	a.	p.		
a. The Planet Junior tooth cultivator.	25	0	0	S. L. Allen and Company, Philadelphia, United States, America.	Clubwalla and Company, 17, Churchgate Street, Bombay.
b. The Planet Junior bullock hoe.	25	0	0	Do. ...	Do.
c. The Planet Junior hand hoe No. 11.	30	0	0	Do. ...	Do.
d. The Planet Junior hand hoe No. 13.	16	8	0	Do. ...	Do.
e. The Planet Junior hand hoe No. 18.	12	0	0	Do. ...	Do.
f. The combined kolpa.	5	0	0	.....	.....
g. Mr. Horn's interculturing implement.	...			.....	.....

5. Returning back by the area devoted to the manurial experiments with cotton, jowar, and groundnut, observe the groundnut raised by the second year students of the college who are obliged to come into personal contact with practical agriculture by performing the work with their own hands.

6. From here, return to the farm buildings. On the way will be seen the improved light ploughs suitable for rice tracts at work. These are—

Name of the implement.	Price.			Name of the makers.	Agents in India.
	Rs.	a.	p.		
a. The Meston plough.	5	8	0	Burn and Company, Calcutta ...	Nil.
b. Massey's tube plough.	12	8	0	Massey and Company, Madras .	Nil.
c. E ₄ St plough ...	15	12	0	Rud. Sach, Leipzig ...	Schlectendahl and Company, Bombay.

7. On approaching the farm buildings, the model cattle sheds will be the first to be given attention to. Examine minutely here, in how many ways the cultivator is losing his manurial resources that could be utilised, and study thoroughly how the different methods demonstrated are simple but more effective.

8. The leading breeds of cattle and buffaloes will be seen here.

9. In the implement shed you will find a collection of various implements—indigenous and foreign. The groundnut sheller and the Káthiáwár gin will be seen at work.

10. The last thing in the implement shed which well deserves your study, is the method of separating cotton seed by a device of Messrs. Mehta and V. G. Gokhale, referred to in one of yesterday's papers.

11. Next you will be taken to the well boring apparatus and from there to the Chemical laboratory.

PROGRAMME OF DEMONSTRATIONS AND EXHIBITS ON VIEW AT
THE POONA AGRICULTURAL COLLEGE BUILDINGS.

(Tuesday, the 16th September, 1913.)

(8-30 A. M. to 11 A. M.)

CHEMISTRY BLOCK.

GROUND FLOOR.

Chemical Laboratory.

1. Adulteration in flour under microscope.
2. Adulteration in butter.
3. Stickiness of soil by flocculation.
4. Bombay minerals collected by students.
5. Rocks of the Bombay Presidency collected by students.
6. Typical specimens of minerals and rocks.
7. Distillation of betel leaves for the essential oil.
8. Exhibition of betel leaves and essential oil from pan.

FIRST FLOOR.

Physical Laboratory.

1. Capillary Phenomena with tubes and plates to illustrate the capillary action in soils.
2. Efficiency of different combinations of pulleys for raising weights.
3. Efficiency of wheel and axle for raising weights.
4. Determining the atmospheric humidity.
5. Finding the volume of fruits.
6. Determining the frictional resistance in the case of a model plough.
7. Water Finder.
8. Specific gravity of seeds.

Chemical Laboratory.

1. Milk analysis.—
 - (a) determination of fat.
 - (b) determination of dirt.
2. Separation of sugar and molasses by centrifugal power.
3. Sugar analysis.—
 - (a) Fehling's method.
 - (b) Polarimeter.
4. Determination of colour with tintometer.
5. Machines for sampling.
6. Analysis of soil.—
 - (a) determination of organic matter.
 - (b) determination of salts in soils.
7. Determination of capillarity in soils.
8. Analysis of water for drinking.—

Test with potassium permanganate.
9. Determination of albuminoid ammonia in water.
10. Determination of admixture in oil cakes with microscope.
11. Exhibition of Bombay drugs.
12. Oils and oil seeds from Bombay.
13. Analysis of oil seeds by extraction of oil.
14. Determination of the value of manure by the determination of nitrogen.

MAIN COLLEGE BLOCK.

GROUND FLOOR.

Agricultural Museum.

1. Rocks from the Bombay Presidency.
2. Chief minerals composing the above rocks.
3. Soils from various parts of the Bombay Presidency.
4. Manures available in this Province.
5. Crops suitable for green manuring.
6. Samples of crops grown in Bombay—

(a) Jowar.	(f) Millets.
(b) Bajri.	(g) Pulses.
(c) Maize.	(h) Oil seeds.
(d) Wheat.	(i) Fibres.
(e) Rice.	(j) Garden Crops and Vegetables.
7. Dairy appliances and dairy operations.

FIRST FLOOR.

Herbarium.

1. Mounted specimens of Bombay rices.
2. The preparation of mounted specimens of plants.

Botanical Laboratory.

1. The Mango—its varieties, propagation, disease, etc.
2. The preparation of microscopic slides showing the internal structure of plants.
3. A contrast in plant structure—Plants of the Desert and Water Plants.

Laboratory of Plant Diseases.

1. Specimens of diseases—

(a) Rusts of cereals.
(b) Smuts of cereals.
(c) Red rot of sugarcane.
(d) Grape vine mildew.
(e) Ring disease of potato.
(f) Rhizoctonia disease of potato.
2. Prevention of disease—

Apparatus for spraying against mildew.
Bordeaux mixture.

Zoological Laboratory.

1. Wild silk moths of India, six framed pictures.
2. Moths of one of the above wild silk moths (*Antherea mylitta*) with eggs and cocoon.
3. Eri silk moth (*Attacus ricini*) in all stages.
4. Mulberry silk moth, in all stages.
5. Spinning of eri silk.
6. Lac, grown near Poona by Mr. T. R. Kotwal.
7. Various wood-boring insects.
8. Various agricultural pests.

Ground Floor.

Big Hall and Library.

PROGRAMME OF DEMONSTRATIONS AT THE GANESHKHIND
BOTANICAL GARDENS, KIRKEE.

(Tuesday, the 16th September, 1913.)

(5 P. M. to 7 P. M.)

1. Methods of budding and grafting.
2. The spraying of the grape vine.
3. The pruning of the grape vine.
4. Citrus plants on various stocks.
5. Model plantations of orange and pomegranates.
6. Plots of wild grasses under test for their fodder value.

Note.—Visitors are requested to leave their carriages on the main road outside the garden and not to bring them into the garden.

APPENDIX V.

PROGRAMME OF THE DEMONSTRATION AT THE MANJRI FARM.

(Wednesday, the 17th September, 1913.)

(8 A. M. TO 10 A. M.)

The party will proceed along the Sholapur Road upto the 8th mile Stone where the field Demonstration of the implements suitable for sugarcane land will be in progress from 8 o'clock.

Ploughs.

- (1) *S. A. E. Gallows* of Ransomes, Sims & Jefferies, London. Agents—Duncan Stratton & Co., Bombay. Price Rs. 70. This plough requires 4 pairs of bullocks and does half an acre per day.
- (2) *Cockshut* of Cockshut Plough Co., Canada. Agents—Marshall Sons & Co., Bombay. Price Rs. 64; with 3 pairs, ploughs half an acre per day.
- (3) *Arlington No. 30* of Belcher Taylor, U. S. A. Agents—Greaves Cotton & Co., Bombay; with 2 pairs, ploughs half an acre per day. Price Rs. 40-10-0.
- (4) *South Bend* of South Bend Plough Co., U. S. A. Price Rs. 45, with 4 pairs, ploughs half an acre per day.
- (5) *Rud. Sach (R. 14 S. N.)* by Rud. Sach & Co., Leipzig. Agents—Schlechtendhal & Co., Bombay. Price Rs. 64; requires 4 pairs, and ploughs half an acre per day.

Harrows and Cultivators.

- (1) Banner arch frame Disk harrow :—Price Rs. 130.
- (2) Climax Combination harrow :—Price Rs. 200.
- (3) Orwell Cultivator :—Price Rs. 200 of Ransomes, Sims & Jefferies. Agents—Duncan Stratton & Co., Bombay.
- (4) Planet Junior Cultivator.—Price Rs. 14-8-0. Agents—Clubwalla & Co., Bombay.

Clod crushers and Pulverizers.

- (1) *Norwegian clod crusher*—by Bajac & Co., France. Price Rs. 200.
- (2) *Crosskill pulverizer*—Price Rs. 150.
- (3) *Tee Bar Roller*—by T. Parsai & Co., Australia. Price Rs. 135.

Corn Cutter.

- (1) *Corn cutter and binder* :—Price Rs. 500 by International Harvester Co., U. S. A. Agents—Macbeth Bros., Bombay.

After viewing this demonstration the party will turn to Manjri Farm and see the Sugarcane planting by the new method, the rotation experiments, showing the advantage of San as green manuring and then the cutting of Jowari by Reapers.

The different kinds of ridgers will be shown working in the fields. The manure plots of sugarcane will next be seen and the party will return to the crushers, noticing the light rail system and low down waggons for bringing in cane to the crushers.

Crushers.

- (1) *The Poona Crusher*—by Bari & Co., Poona City. Price Rs. 140. Capacity 3 tons of cane per day of ten hours; average extraction 65 p. c.
- (2) *The Pearl*—Agents, Clubwalla & Co., Bombay. Price Rs. 300. Average extraction 70 p. c. Capacity 4-4½ tons of cane per day of ten hours.
- (3) *The Nahan*—(Nahan Foundry, Punjab). Price Rs. 160; extraction 66 p. c. Capacity 2-2½ tons of cane per day of ten hours.
- (4) *Saiara Wooden* :—Used in very backward places. Price Rs. 80; extraction 58 p. c.
- (5) *Power Crusher* :—(3 rollers, size 14" × 20") by Manlove Alliot & Co., England, worked by Oil Engine (18 B. H. P.) of Ruston Proctor & Co.

Price of crusher—Rs. 2,300.

Price of Engine—,, 3,000.

The boiling of gul on different kinds of furnaces, *viz.*, Poona, Double, Triple and Multiple will be shown in progress. The use of Saccharimeter for juice testing, of the Thermometer for striking the pan, and the use of scum strainer, gul moulds, etc., will be explained.

The sugar-making by Hadi process will next be seen.

On the verandah of the office a small demonstration of manures for sugarcane, gurhal accessories and varieties of cane, etc., will be kept for view of the party.

The value of skimming will be actually demonstrated by working samples of juice on stoves

APPENDIX VI.

THE ORGANISATION OF AGRICULTURE BY THE DEPARTMENT OF
 AGRICULTURE IN IRELAND AND ITS APPLICATION TO THE
 CONDITIONS OF THE BOMBAY PRESIDENCY.

The question which no doubt will arise in the minds of everyone who has read the subject of this paper is "what has Ireland got to do with the Bombay Presidency and how can conditions there be applicable to those of this country?"

I have tried to keep this very natural criticism in mind, and I hope you will be convinced that the similarity of conditions is so remarkable that the experience of Ireland can be of the greatest value to us in Bombay.

The Agricultural branch of the Department of Technical Instruction in Ireland was started in 1900, and the first duty undertaken by the staff was to get in touch with the County Councils, of which there are 33, and to study the rural economy and agriculture of the island.

The conclusions arrived at after a preliminary survey of the situation was completed, were (1) that owing to the backwardness of the people and the averseness of the small holder to leave his land a permanent and comprehensive system of agricultural education in the widest sense of the term was necessary, (2) that as far as practicable the Department should devote a large part of its funds as an endowment to aid local authorities in the development of agriculture, (3) that the Department should retain the direction of the development by local authorities in its own hands, only in so far as was necessary to secure co-ordination and a uniform policy on lines laid down by the central authority.

The organisation which was evolved to secure the above objects, I will describe as briefly as possible, and then proceed to give in outline my ideas as to how it could be adapted to this Presidency. It is hardly necessary to state that my views must be regarded as personal and in no way official.

Each of the 33 County Councils levies a rate of $\frac{1}{2}d.$ to $1d.$ in the pound on the rateable value of the holdings within its limits. The levy of this rate is optional under the Act, but since the second year after the passing of the Act every Council has levied the rate.

In 1907 the average amount raised and devoted to agricultural purposes by each Council was about Rs. 15,000. Each Council for the purpose of the Agricultural Department's work appoints a Committee of Agriculture composed partly of members of the Council, and partly of other persons. To this Committee the Council usually delegates full powers, subject to the approval of the Department, for the administration of funds placed at its disposal.

The relations between officers of the Department and the Committees have been excellent. The members and officers are constantly in conference, either at the local meetings or at the head offices of the Department, to discuss the details of, and the arrangements for, carrying out the work. Each Committee is invited by the Department to submit its views on the working of the schemes laid down for their adoption, before the commencement of each agricultural year. Suggestions made by them in the great majority of cases have been adopted, and if a County Committee considers itself aggrieved by some action of the Department, the Committee can ventilate its grievance through the Council of Agriculture, a body appointed specially for this purpose, and to whom the Department must answer if it ignores public opinion.

The amount of work done and money expended by the County Committees has steadily increased. The total amount raised last year by the voluntary rate, (for the most part now equal to one penny in the pound), was about £43,000 or Rs. 6,45,000, or an average for each Council of about Rs. 19,545.

In the early years the Department recouped County Committees one-half the cost of each piece of work except in the case of a number of poorer Counties, whose proportion was increased to five-ninths. Later the Department's contribution has been three-fifths of the actual cost of each scheme undertaken in the poorer Counties, and five-ninths in all other Counties. In addition however the Department in the case of certain live-stock schemes pays the whole of the fees and expenses of the Judges and Veterinary Surgeons who act at local shows, as well as the fees and expenses of the Judges in connection with the award of prizes for good farming and well-kept cottages. The Department also pays the whole salary of itinerant instructors of agriculture, the cost of pioneer lectures, and of special investigations and inquiries.

In 1907 the Department contributed in all £48,000 or Rs. 7,20,000, as compared with nearly £32,000 or Rs. 4,80,000 raised from rates. Thus the average amount of the Joint Fund available to be spent by each Agricultural Committee in each County was Rs. 36,345, though it must be understood distinctly that each County receives a grant in proportion to the sum raised by the voluntary rate. The guiding principle of the Department is to help those who help themselves.

I will now proceed to describe the system under which the joint fund is administered.

The work to be performed by the County Committee is limited by certain schemes which are drawn up for their guidance by the Department. They may adopt any one or more of them, but they cannot spend money outside them. These schemes comprise improvements in the breeds of cattle and other animals; itinerant instruction in agricultural subjects; prizes for cottages and farms; subsidies to live-stock shows; field experiments and demonstrations with manures and seeds; systematic instruction in winter schools of agriculture; instruction in the keeping and marketing of poultry; instruction in horticulture including the purchase and distribution of trees at cost price; instruction in bee-keeping and home butter-making.

I will give the main points of one or two of these schemes, in order to give you an idea of their nature.

The scheme for encouraging improvement in the breeds of cattle aims at encouraging the breeding or introduction of pure bred bulls or registered dairy bulls of a high degree of excellence, and inducing associations of farmers or persons of means to purchase high class bulls for the use of small farmers.

The details of the scheme are framed by a sub-committee of the County Committee in accordance with the conditions of the Department's general scheme. The money sanctioned by the Committee with the approval of the Department, is to be applied solely in providing premiums for bulls, though sometimes loans are given to individuals for the purchase of bulls. The pedigree, age and health of the bulls must be in accordance with the rules laid down. The premiums range from Rs. 150 to 225 and are renewed each year on proof that the bulls have been fruitful and are in satisfactory condition. These bulls are often purchased at cattle shows from those selected as fit by the Department. The owner of a bull who receives a premium must advertise the fact, and the bull must serve not less than 30 to 40 cows other than those that are the property of the owner of the bull. The service fee which the owner may charge is from annas twelve to Rs. 1-14 per cow, until the minimum of 30 or 40 cows have been served, when he may charge what he likes. The owner must abide by rules laid down by the County Committee as to care of the bull, exclusion of other bulls from his herd, etc. The bull must be made available for the service of the cows of genuine farmers living in the County in the order in which they are presented, and it can be branded or inspected by officers of the Department, if necessary.

The scheme for instruction in agriculture provides that the County Committee should appoint one or more instructors, and the Department do their best to supply qualified persons. These instructors do the same work as our district agricultural overseers, but in addition, deliver regular lectures and often hold winter classes for four days in each week during the winter months. The teaching in the latter is much the same as the theoretical part of the curriculum of our Vernacular Agricultural School, with a small amount only of practical demonstration.

The year's work is carried out as follows:—

The agricultural year commences in autumn, but in June the Department circularise all the County Committees inviting their views on the work of the previous year. The views of the Department's instructors also are obtained, and where matters of national importance are involved or expert advice is required, advisory committees of experts are invited to help in the deliberations.

A programme in outline is prepared by these committees and the details are left for each local committee to settle as it sees fit.

Early in August these outline schemes are laid before the Agricultural Board, with a statement of the amount of money which it is estimated will be required from the Department's fund;

- (1) to meet the cost of central administration,
- (2) to meet the Department's contribution to the funds of the County Committees.

When the latter has been voted by the Board, a conference of the Secretaries of the Committees is held to discuss any new provisions in the schemes and to fix the dates for meetings of the Committees; at which the Department's inspectors must attend to help the Committees to arrange the details of the programme of work for the ensuing agricultural year. The schemes which the Committees desire to adopt and the provisional allotment of funds proposed are intimated to the Department, which then intimates its approval as well as the maximum of the departmental contribution for the year. The appointment of sub-committees to assist the statutory Committees is a most important element in the successful carrying out of the schemes. The County Committees meet, as a rule, once a month and a representative of the Department always attends the first meeting and as many subsequent ones as possible.

To obtain an insight into the working of County Committees I visited Tyrone where a good type of Committee is to be found. There were 29 members on the Committee and the following staff were employed by it:

- (1) A permanent secretary appointed by the Committee.
- (2) 1 Itinerant Instructor in Agriculture.

- (3) 1 Assistant Instructor in Agriculture.
- (4) 1 Itinerant Instructor in Horticulture and Bee-keeping.
- (5) 1 Itinerant Instructress in Poultry-keeping.

The Assistant Instructor in Agriculture spent his time from 25th October to 5th March in giving courses in agriculture at three centres.

The Itinerant Instructor in Agriculture gave lectures during the winter months at 13 centres on such subjects as the use and purchase of manures and storage of farmyard manure, foods and feeding, the management of the potato crop, and the management of grass lands. He distributed leaflets, laid out demonstration plots at the centres where lectures were given, attended shows and went about giving advice and help to farmers on all sorts of subjects. Besides he visited demonstration and experimental plots and obtained the results of them.

The Horticultural Instructor gave lectures in the winter at 14 centres and spent the rest of his time distributing trees and visiting gardens to help the owners, and three demonstration plots in his charge.

The Itinerant Instructress in Poultry-keeping gave lectures at 10 centres in 6 months and judging from the figures of average attendance, her lectures were better appreciated than those of her colleagues. The rest of her time was taken up in visiting farms, where premiums had been paid to the owners for keeping pedigree birds and for distributing their eggs for setting, and in giving advice as to diseases of poultry and their proper housing.

The Secretary was the most important member of the staff, and on him largely depended the success of the work. Powers of organisation and, in a country like Ireland, much tact are required.

The Bombay Department of Agriculture is not behind Ireland in the matter of higher agricultural instruction.

Our college is equipped as well as the branch of the Royal College of Science devoted to agriculture. The multiplication of vernacular agricultural schools in the Presidency which is taking place, will soon put us on a footing of equality with Ireland in this respect. Our agricultural stations for experimental purposes are more numerous and better equipped. It is in the organisation of their district staff, and the system by which the small farmer is interested and led to co-operate in schemes for agricultural improvement, that Ireland seems to me to be so far ahead of this Presidency.

The difficulties with which the Department had to contend were as great or greater than exist here. I will quote freely from a report on this subject.

"A factor which has to be taken into consideration in devising a system of agricultural education is the fact that in Ireland there is an extraordinary desire on the part of young men of the country to escape from farm life. Their education is all directed towards fitting them for occupations of a wholly different character, and the brightest of the family receives an education often at the expense of the son who is to succeed the father. It is impracticable to bring the farmer himself to school, and therefore the only way he can be brought into contact with the application of science to agriculture, is by sending round instructors to give lectures in the evenings; to visit holdings during the day and discuss privately with the occupiers the various problems which confront them in their practice. With the agriculture of Ireland in a backward condition, where the smartest sons forsake the land, where the holdings are often too small to be economically managed, where the farmers' financial resources are very limited, where a system of agricultural credit, often of the worst possible description, exists and where the people have been taught that improvement of their land may mean an increase in rent, the commission will realise that the Department had very real difficulties to face."

Might not these words have been written of the conditions in this Presidency and can not the remarkable advance made in Ireland serve as a lesson to us? When I add that in Ireland there are over half a million holdings, of which 350,000 do not exceed 30 acres, and 220,000 do not exceed 15 acres; that out of 550,000 agricultural holdings 390,000 peasant proprietors have been created by advances from the State of 120 million sterling and only 160,000 remain to be created, I think, gentlemen, you will agree with me that the conditions are extraordinary alike.

I will proceed to outline my ideas as to how the Irish system could be adopted in this Presidency.

I would give District Local Boards the power, by a special Act, to raise an agricultural rate of one pie to 3 pies in the rupee on the land revenue or $\frac{1}{12}$ th to $\frac{1}{4}$ of the local rate levied at present, and to appoint a Committee composed partly of its own members and partly of members of Taluka Local Boards. I would suggest that the Committee be constituted as follows:— $\frac{1}{2}$ the members elected by the District Local Board from its own members, $\frac{1}{4}$ elected by Taluka Local Boards from their own members and $\frac{1}{4}$ nominated by the Collector from persons specially interested in agriculture.

Government might contribute $\frac{1}{2}$ to $\frac{3}{4}$ the amount raised by the District Local Board towards each scheme of agricultural advancement adopted by the Committee and approved by the Department, in addition to paying the salary and allowances of the existing Divisional Inspectors of Agriculture and their staff and of the District Agricultural Overseer. These officers would serve as links between the Department and the Agricultural Committees.

When 10 out of 19 districts in the Presidency had appointed Agricultural Committees and raised a rate, I would appoint a Provincial Council of Agriculture composed of members elected by the District Agricultural Committees—say, one member for every 5,000 rupees raised in any district—and of which the Director of Agriculture, the Deputy and Extra Deputy Directors and certain members of the Agricultural College staff should be *ex-officio* members.

The Council should have the power to invite to its deliberations any experts in agriculture or trade whenever it thought fit. It would sanction the allocation of contributions from Government to Agricultural Committees, consider representations from them, and serve as an advisory and controlling authority in all matters connected with the administration of the Joint Funds.

The Director and the Department must retain exclusive control of all experimental work, but, in spite of the fact that I am a sun-dried bureaucrat, specially cured by some years' service in Upper Sind, I believe that the advancement of agriculture amongst the agricultural community can be secured only by the closest co-operation with the rayats and their leaders who must be given, subject only to such restrictions as exist in Ireland, the control of the money which they raise voluntarily. Many will object that no District Local Board will come forward to raise a local rate of even one pie: that the imposition of such a rate would be unpopular and that Agricultural Associations should perform the functions of the Agricultural Committees which I propose. No one would have believed that in a poor country like Ireland—much poorer, taking everything into account, than this Presidency—a voluntary rate would be imposed by every Council within two years of the passing of the Act. If the nature of the scheme proposed and the benefit to be derived by the cultivators be explained to them, I believe that in certain districts of the Presidency there will be no difficulty in raising a cess of one pie, and that other districts would soon follow suit.

In the Chopada Taluka of East Khandesh District half a lakh of rupees was raised by voluntary subscriptions chiefly from landowners and cultivators for the creation of schools, agricultural education and the improvement of agriculture. The example of this taluka is, I understand, being followed by others in the district.

The money was raised by the people for the people, and as long as that principle is maintained, I have seen that money is forthcoming readily. The amount of money raised by Agricultural Associations for shows and other purposes during the last two years has amounted to Rs. 15,000, and the largest sum raised at one time was Rs. 4,000.

Agricultural Associations have done much pioneer work for the Department in helping to spread interest in agricultural improvements. They have received assistance from the Department which has been given willingly, and I am very grateful to the members of many Associations who have taken the greatest trouble in collecting subscriptions, organising shows, conducting demonstrations and preaching the adoption of new methods by word and deed. It is unnecessary to state the amount of good work performed by such Associations as the Deccan Agricultural Association, the Broach, Dharwar and Kolaba District Associations and many others. But these associations are as conscious of the lack of regular funds and staff as I am, and I am convinced that no regular and sustained progress is possible without both.

The establishment of Agricultural Committees will not mean the death of Agricultural Associations in the Presidency, any more than it has meant this in Ireland. The Associations in Ireland have received support and a new lease of life from the establishment of the Committees, and there is plenty of work remaining for associations to carry out, which is suited to their constitution. I refer to such activities as the holding of shows, the publication of agricultural literature, the holding of meetings at which papers are read and discussed and the undertaking of small experiments by members.

In the future, I hope to see associations established to encourage the breeding and registration of pedigree stock; for the improvement of horticulture and the packing and marketing of fruit; for the establishment of a breed of poultry worthy of the name, and for many other objects.

You will find appended to this paper a statement of the amount of revenue derived from the one anna cess in each district of the Presidency and the amount which could be raised by a special agricultural rate of one pie in the rupee on the land revenue. The figures are based on those of the year 1911-12. It also shows the amount available as a joint fund, on the assumption that Government contribute half the sum raised in each district.

A rich district like East Khándesh, would have nearly Rs. 23,000 to spend yearly on different schemes of agricultural improvement, and I will indicate what could be done to benefit the rayat by an Agricultural Committee, with such a sum annually at its disposal.

It could maintain a demonstration farm chiefly devoted to demonstrating the advantages of improved methods of tillage, the sowing of selected seed, the conservation of farmyard manure, the steeping of the seeds of cereals in copper sulphate—a practice followed by all good farmers in Europe—and the value of a proper rotation of crops.

Similar demonstrations could be carried out by subsidies to selected farmers in each of the remaining nine talukas.

At headquarters, or a suitable centre in the district, and forming part of the Demonstration farm, I would have a depôt for the storage of seed, implements and their spare parts, and a workshop for the manufacture of implements and their repair, where cultivators could get repairs carried out and learn to execute simple repairs themselves. In every taluka I would have a sub-depôt for the stocking of implements and spare parts.

In addition to the present Agricultural Overseer paid by the Department, I would appoint a graduate in agriculture with experience, who would be in charge of the demonstration farm in the rains and spend his time from December to May in touring through the district, holding classes for 14 days at certain centres for teaching agriculture and accounts etc., to the sons of agriculturists who have passed through the course at the rural schools. Owing to the late decision of Government, agricultural readers and everything but the three R's, have been abolished in the curriculum of rural schools.

The son of the cultivator is to attend school at 4 or 5 years of age and to complete his education at the age of 8 or 9. It is expected that he will be required to help his father in the fields at that age. Is there not a danger that after 3 or 4 years of herding cattle or working in the fields, he will have forgotten all he learnt at school, unless he is got hold of by an experienced teacher and taught that his knowledge of the three R's can be of practical use to him, in enabling him to become a good farmer and to remain in touch with the larger world outside his own village and district? If we give an education to the ordinary village boy, which at the age of 20 will enable him just to sign his name and perhaps to call himself "literate" at the next census, the money spent on his education will be wasted.

Perhaps allowances might be given out of the joint fund later on, to primary school teachers who attend a course of agriculture at the college and qualify themselves to teach the simple principles underlying good husbandry in night and hot weather classes. In Belgium some such system exists.

In addition to the chief itinerant graduate, three assistants could be appointed, one for each sub-division. These men could be given a specially constructed cart, in which apparatus for demonstrations of the use of implements and the teaching of the elementary facts of plant life, insect pests, manuring, feeding of stock etc., could be carried, and classes could be held in all the chief villages of their charge.

They would supervise also the demonstration plots and the management of sub-depôts for the distribution of seed and implements. Handsome contributions towards shows of agricultural stock and produce, the payment of premiums to the owners of stud bulls and selected growers and distributors of improved seed, and scholarships for boys selected to attend the Vernacular Agricultural School at Loni Kalbhor, could be given.

Lastly a boring staff making bores in existing wells and prospecting for new wells at cost price, could be maintained for the benefit of cultivators.

I have appended to this paper a sample budget which might be adopted by an Agricultural Committee in East Khándesh. It is a rough estimate and intended only to be suggestive, and no doubt there are many points which would require modification.

For the first few years much of the fund would be used up in capital expenditure.

If this paper succeeds in arousing the interest of this Conference in a system of agricultural organisation which has been of immense benefit to Ireland, I shall have accomplished something. If I succeed further in inducing this Conference to pass a resolution in favour of some practical steps being taken to introduce a similar system into this Presidency, I shall have done much; because what is approved by a Conference of gentlemen representing the agriculture of every district, must carry great weight and command serious attention.

W. W. SMART,
Ag. Director of Agriculture,
Bombay Presidency,
Poona.

APPENDIX I.

No.	Name of District.	Local rate.	1 pie rate.	Government contribution.	Total of col. 4 and 5.
1	2	3	4	5	6
		Rs.	Rs.	Rs.	Rs.
<i>Northern Division.</i>					
1	Ahmedabad ...	40,336	3,361	1,680	5,041
2	Kaira ...	64,294	5,358	2,679	8,037
3	Panch Maháls ...	5,258	438	219	657
4	Broach ...	1,79,563	14,964	7,482	22,446
5	Surat ...	1,70,710	14,226	7,113	21,339
6	Thána ...	1,02,645	8,554	4,277	12,831
<i>Central Division.</i>					
7	Ahmednagar ...	1,02,422	8,535	4,267	12,802
8	East Khándesh. ...	1,83,853	15,321	7,660	22,981
9	West do. ...	98,776	8,231	4,115	12,346
10	Násik ...	1,00,997	8,416	4,208	12,624
11	Poona ...	1,05,488	8,791	4,395	13,186
12	Sátára ...	1,77,839	14,820	7,410	22,230
13	Sholápur ...	85,237	7,103	3,551	10,654
<i>Southern Division.</i>					
14	Belgaum ...	1,12,940	9,412	4,706	14,118
15	Bijápur ...	1,10,645	9,220	4,610	13,830
16	Dhárwár ...	1,66,476	13,873	6,936	20,809
17	Kánara ...	60,233	5,019	2,509	7,528
18	Kolába ...	98,047	8,171	4,085	12,256
19	Ratnágiri ...	61,096	5,091	2,545	7,636
	Total ...	...	1,68,904	84,447	2,53,351

APPENDIX II.

Annual recurring cost of demonstration Farm of 30 acres	...	...	1,500
Annual cost of Head Quarter Depôt for distribution of seed, implements and their repair	...	...	880
9 Táluka Depôts {	Rent	...	540
	Watchman and contingencies	...	1,080
9 Táluka demonstration plots at Rs. 100 per annum	...	...	900
Itinerant graduate of Agriculture at Farm in rains and on tour in open season at Rs. 150 per month	...	...	1,800
3 Assistants on Rs. 50 per month	...	...	1,800
4 Specially trained peons on Rs. 10 per month	...	...	480
Travelling Allowance of travelling officers...	...	...	840
Carriage of apparatus...	...	...	400
Secretary on Rs. 50 per month...	...	...	600
Clerk to same Rs. 15 per month	...	...	180
Contingencies for officers	...	...	350
			11,350
Contributions to shows	...	...	5,000
Scholarships to send 10 boys to Agricultural Vernacular School	...	...	750
Loss on distribution of seed, etc.	...	...	600
Premiums to 20 stud bulls at Rs. 60 per annum	...	...	1,200
Premiums to 20 registered growers of improved seed at Rs. 100 per annum	...	...	2,000
Boring staff for carrying out boring at cost price for farmers	...	...	1,800
Balance in hand	...	...	300
			23,000

THE SUPPLY OF MILK TO INDIAN CITIES.

The supply of milk to Indian cities is known to be at present in a very unsatisfactory condition. Whether looked at the point of view of the healthiness of the milk obtainable, or of the quality of the milk to be had, or of the quantity available,—it is open to the most strenuous criticism. There is no control at present whatever in most cities,—except possibly the Presidency towns and one or two others. The act for the prevention of adulteration (Act II of 1899) in Bombay is a dead letter. And as a result of these things, the condition must be recognised as unsatisfactory from every point of view. This would be inexcusable except for one fact which increases the difficulty of dealing with the problem. The cost of milk is already very high: anything which would increase the price, even though it made the supply a better one, would but increase the difficulty of getting it to those people of the poorer classes who are at present suffering most from the present conditions. At every point, in every proposed method of dealing with the matter, one is met by the difficulty of controlling, of improving the supply without increasing the cost,—for, and I repeat it, if a remedy involved a material increase in the cost it would be perhaps worse than the disease.

To show exactly where we stand it would perhaps be best to give a description, obtained from data collected, much of it, specially for this paper, of the present supply of a city, namely Poona. It is typical of many other places: the difficulties which surround the problem here are those which are found elsewhere: and it is probable that a thorough appreciation of the present position may at once lead to a clearer understanding of the methods which are feasible to improve the situation.

Poona City contains, according to the last census, a population of 1,17,256. Its population is a fairly representative one, save that perhaps the so-called higher classes are in slightly greater numbers than usual. There is a limited amount of manufacturing industry, but Poona cannot be called a factory town. It lies in a district which is dry, almost semi-arid, except where irrigation occurs,—but both above and below the city there is a large area watered and irrigated by the Mutha Canal extending from eight to ten miles above the city to fifteen miles below. Irrigation from wells is frequent in the country round,—and that this country is adapted to the production of fodder is seen by the train loads of *lucerne* which are sent to Bombay every day for feeding horses.

The city like all others is partly supplied from milk animals kept in the city, and partly from milk brought in from outside. I will deal with the latter source of supply first, and am able to give figures obtained from an actual census of the amount brought on two days into the city boundaries. There are fifteen entrances to the town and the milk is brought from no less than forty-seven villages.

The actual supply brought in, in one day amounted to 5,560 pounds, almost all of which was brought in by hand and, in a few cases, by bullock cart. The train was only used for the milk from three villages,—and the amount brought only amounted to 120 pounds. For the remainder the milk came as follows:—

From villages three miles or less from the centre of Poona.	1,168 pounds or 21 per cent. of the total.
From villages from three to six miles from the centre of Poona.	2,688 pounds or 48·3 per cent. of the total.
From villages from six to nine miles from the centre of Poona.	1,582 pounds or 28·5 per cent. of the total.
From villages over nine miles from the centre of Poona (by train).	120 pounds or 2·2 per cent. of the total.

It will be seen, therefore, from how restricted an area Poona City draws its milk supply. It is practically all brought in from the immediate neighbourhood, the railway is not used to any appreciable extent, and the means of bringing it are of the crudest.

As already stated it is usually brought by hand and generally in brass pots slung over the shoulders of the milkmen, or carried on their heads. The number of people engaged in this work, and for many of them it must mean the loss of at least half a day, is 351, and the average amount brought per man is only sixteen pounds. It is evident, therefore, that this portion of the Poona City supply is brought and distributed in an exceedingly uneconomical manner, and involves a very large waste of labour without any corresponding advantage.

But what of the price and quality of the milk thus brought into a city like Poona? In the first place, by far the largest amount is buffaloes' milk. Out of the animals supplying the milk, in number 956, only 178 were cows,—and taking the yield of a cow in the Deccan at 5 pounds and of a buffalo at 10 pounds of milk per day this would indicate that only 8½ per cent. of the milk brought into the City is provided by cows, and the remainder by buffaloes. This indicates the extent to which even in the Deccan, the buffalo proves itself *the* milking animal of India.

Bought at the entrances to the City, the price varies with the quality. The result of all my previous investigations would indicate that for such cows as occur in the Deccan, all genuine cows' milk contains at least $3\frac{1}{2}$ per cent. of fat and $8\frac{1}{2}$ per cent. of other solid matters ("Solids, not fat"), while the corresponding figures for buffaloes' milk are 5 per cent. of fat and 9 per cent. of other solid matter. These figures are, in fact, exceptionally low, and ninety per cent. of actual genuine samples will be far richer than these figures show. In determining the number of adulterated samples, I have allowed all samples to be genuine which, even on this basis, showed less than ten per cent. of water added. On this basis, out of fifty-one samples collected at the entrance to the City, only ten were genuine or less than twenty per cent., the remainder were adulterated with more than ten per cent. of water. The amount of adulteration varied with the price charged here, as well (as we shall see later on) in samples bought at shops in Poona City. Of samples bought

- (1) at 4 seers (8 pounds) per rupee, all were genuine ;
- (2) at 5 seers (10 pounds) per rupee, sixty-four per cent. were adulterated with water and the average amount of water added was *twenty-nine parts* to 100 parts of genuine milk ;
- (3) at 6 to 7 seers (12 to 14 pounds) per rupee, fifty per cent. were adulterated with water, and the average amount of water added was *forty-seven parts* to 100 parts of genuine milk ;
- (4) at 8 to 9 seers (16 to 18 pounds) per rupee, ninety-two per cent. of samples were adulterated with water, and the average amount of water added was *seventy-two parts* to 100 parts of genuine milk ;
- (5) at 10 seers (20 pounds) or more per rupee, all the samples were adulterated with water, and the average amount of water added was *one hundred and seventeen parts* to 100 parts of genuine milk.

Thus the close connection even before the milk reaches the city between the price and the amount of water added is evident,—and the fact of the almost general adulteration of samples now brought from outside seems proved.

We are in fact able to conclude that at present, in so far as Poona is a typical city that

- (1) the milk brought from surrounding villages for city consumption is almost all brought in small quantities, and carried by hand,
- (2) this milk is adulterated with water in the case of practically eighty per cent. of what enters the city,
- (3) the amount of water added varies very closely with the price at which the milk is to be sold,—and there is not even an even chance of getting pure milk if more than six seers (12 pounds) of milk are obtained per rupee while the cheaper milk contains already more than its own volume of water. This is at the entrance to the city, before the retailers' profits are added and retailers' adulteration occurs.

In one matter I have been rather pleased with the condition of the milk,—namely in the amount of dirt it contains. This is not nearly so great as would have been expected, and does not show the addition of quantities of dirty water. I have divided the milks into four classes, and the results of examination of fifty-one samples is as follows, the dirt being determined by 'Gerber's dirt tester':—

Clean, or nearly clean samples	... 56.7	per cent.
Fairly clean samples	... 33.3	"
Distinctly dirty samples	... 7.8	"
Very dirty samples	... 1.9	"

But, after all, the milk brought into Poona City only forms a portion, and not a very large proportion, of the milk consumed there. A much larger quantity is obtained from animals maintained in the city itself, and for information with respect to this, I am indebted to a census of cattle taken by the City Health Department some time ago,—as well as to inquiries by my own assistants.

According to this census there were 2,688 milking animals kept inside the city, of which 1,532 or 57 per cent. were kept for private use only, and 1,136 or 43 per cent. kept for sale of the milk. I do not propose to refer further to the former class, except to note that among these animals kept for private use by far the larger proportion were cows and not buffaloes,—these amounting to 73.5 per cent. of the total number so kept. This probably arises from the fact that a cow is much more easy to attend to than a buffalo, and can usually be tended by a member of the household. A buffalo, on the other hand, requires a servant as not only is its feeding more troublesome but it has to be taken out every day, and requires far more thorough washing. But it seems nevertheless, from the preference for it by milk-sellers, that the buffalo is found to be a more profitable milking animal.

Among the animals kept for the sale of their milk (1,155) 224 or 19.75 per cent. were cows, and 932 or 80.25 per cent. were buffaloes.

The sheds in which they were kept were distributed all over the city, and were mostly very small. Over eighty per cent. of these sheds had less than ten animals, and over fifty-five per cent. had less than five animals. They were situated in all sorts of positions, without any control. Nearly six per cent. were under a dwelling house: over six per cent. were either *in* a dwelling house or on the verandah of a dwelling house: over fifteen per cent. were attached to and continuous with a dwelling house, while sixty-three per cent. were in the compound of a dwelling house. Though the pavement of the milk sheds was good (being made of stone) in thirty-seven per cent. of cases, yet the remainder were very bad. No pavement whatever existed in over thirty-two per cent. of sheds, and in sixteen per cent. it was so bad that it might as well have not been present. So far as these two classes of sheds are concerned, they are abominably insanitary, the urine sinks into the ground and remains there. The sheds too are overcrowded. Allowing six feet as the necessary length for an animal to stand, the width allowed in the shed for each animal is only $3\frac{1}{2}$ feet in three per cent. of cases, less than 5 feet in 14 per cent. of sheds, and less than $6\frac{1}{2}$ feet in twenty-three per cent. further of the sheds.

The milk produced by these animals can only be estimated, but taking the same rate of production as has previously been suggested (5 pounds per cow and 10 pounds per buffalo per day) the amount available from animals kept in the City will be—

Private sheds—

Cows (1,126 at 5 pounds)	... 5,630 pounds.
Buffaloes (406 at 10 pounds)	... 4,060 "
	<hr/> 9,690 pounds. <hr/>

Sheds for sale—

Cows (224 at 5 pounds)	... 1,120 pounds.
Buffaloes (932 at 10 pounds)	... 9,320 "
	<hr/> 10,440 pounds. <hr/>

This gives a chance of estimating the total daily supply required by a city of the size of Poona, and if the above figures be added to those of the milk brought in from outside, the amount comes to 25,690 pounds; of this 21.25 per cent. is obtained from outside sources, 37.72 per cent. from animals kept by householders for their own use, and 40.63 per cent. from animals kept by *gowalas* in the city for the sale of the milk. This gives an idea of the problem which is before anyone who wishes to improve the milk supply of a large Indian city.

We have now to consider the organisation for the sale of milk. There is one regular milk market (Jogeshwari) where all outsiders who bring milk for general sale, are found, and where retailers congregate to purchase this supply. By the time it is exposed for sale here the milk has become dearer, and has also become more adulterated. We purchased only ten samples here, but they were obtained in several days, at prices varying from four to nine seers, per rupee.

- (1) One sample was brought at four seers per rupee and was genuine.
- (2) Three samples were brought at five seers per rupee: two of these had water added, the average amount *being sixteen per cent. of the original milk.*
- (3) Three samples were brought at six and seven seers per rupee: all were adulterated, and on the average the milk as sold consisted at least *to the extent of one-half of added water.*
- (4) Three samples were brought at eight and nine seers per rupee: all were adulterated, and on the average the milk as sold contained *135 parts of water for every 100 parts of original milk.*

The chance of adulteration, therefore, and the quantity of water added varies almost exactly with the price,—and even at the wholesale milk bazaar in the city, if more than four seers (8 lbs.) of milk are obtained per rupee there is an almost absolute certainty that pure milk will not be obtained.

When we come to the milk as retailed in the shops in Poona City, the state of things is still worse. Here even if the very high price of four seers per rupee* is paid there is no certainty of getting pure milk. Even at this price out of nine samples obtained

* It may interest those acquainted with the milk trade in England to note that four seers per rupee is equivalent to nearly to 2½d. per pint.

only six could be passed as pure even with the exceedingly low standard we are setting up. Of the others thirteen parts of water were added on the average for 100 parts of milk. If the price is lower, the adulteration becomes a certainty. At 6 to 7 seers per rupee, there is, on the average, 47 parts of added water for every 100 parts of milk; and at 8 seers per rupee, there is no less than 92 parts of added water for every 100 parts of milk.

I am able to get an idea as to whether the condition of things is getting worse or no by comparing these results with those obtained by one of my assistants (Mr. S. R. Paranjpye) in Poona City in 1911. He then found the results indicated in the following table :—

	Price 4 seers per rupee.	Price 5 seers per rupee.	Price 6—7 seers per rupee.	Price 8 seers per rupee.
Number of samples taken ...	1	2	5	18
Genuine samples ...	1	.....	2	2
Adulterated samples ...	.....	2	3	16
Water added for 100 parts of pure milk ... ..	.....	23 parts	49 parts.	37 parts.

It would seem evident that while adulteration is no more general than two years ago, yet it is more shameless and the quantity of water added for milk of the same price is much more than it was previously. In other words, *pure* milk is rising in price very rapidly, and the probability of getting pure milk at any particular price is getting less.

I may now summarise my conclusions with regard to the present condition of city milk-supply of Indian cities, so far as they are illustrated by experiences in Poona, considered as a typical city.

(1) The milk supply is partly (to the extent of about one-fifth) brought from the outside of the City. This amount is drawn from the immediate neighbourhood and is almost all brought in by hand in small quantities.

(2) The remainder is produced inside the City,—partly by animals kept in or in connection with houses, for private use only,—and partly by animals kept for the most part in unsatisfactory and insanitary small sheds.

(3) Except for the animals kept for private use about ninety per cent. of the milk is produced from buffaloes.

(4) The milk as it enters the City from outside is already very largely adulterated with water,—the adulteration varying with the price. No milk costing less than 4 seers per rupee can be expected to be pure.

(5) The milk as obtainable in the City itself is adulterated to a still greater extent. Again no milk bought at a lower price than 4 seers per rupee is likely to be pure,—while it is practically certain that all milk costing 6 seers per rupee or less will be adulterated.

(6) The practice of adulteration is increasing in shamelessness, the amount of water added is greater and greater,—as the price of pure milk tends to rise.

(7) The dirt in the milk is not so great as would be expected from the insanitary and dirty conditions under which the milk is produced.

Such being the conditions of the milk supply at present in Poona,—and there is no reason to suppose that the conditions would be materially different in other big cities,—the question at once arises as to what can be done to deal with the situation both as a piece of sanitary improvement, and as an agricultural problem.

From a sanitary point of view what we want to do is to ensure

(1) That the cattle—cows or buffaloes—giving milk are healthy. Of this there is no control whatever at present.

(2) That they are kept under sanitary conditions. For the animals inside the City I have shown that this is not the case now, and there is every evidence that the conditions in the villages from which the milk comes are no better, except for the fact that there is plenty of fresh air.

(3) That the milk should be in good condition when delivered to the customers. The milk is delivered only once a day, and hence has to be kept without pasteurisation or other method of preserving, in a hot climate for many hours.

(4) That the milk should not be mixed with water or creamed before sale.

(5) That the arrangements for bringing to market should be such as to prevent the milk becoming dirty, or liable to be infected with objectionable materials.

This represents only one side of the question. From an agricultural point of view we want to find out the most economical method of meeting the large demand for milk from our cities and placing it at their disposal at the cheapest rate possible. Once more I would state that in my opinion the question of price is vital. Any attempt to impose sanitary measures which will result in a rise in price of pure milk will be a mistake, and the problem is to find a method of so economising in the production of milk and in the method of its conveyance to market that it will be possible to impose restrictions in the interests of sanitation without raising the price.

Is this possible? I think it is, judging by the experience of the last few years here, and by the experience of almost all other countries in which the dairy industry is highly developed. I shall not be able in this short account which follows to give all the reasons for the positions I put forward, but the evidence is available.

In my mind, three things are radically wrong with the present milk supply, as illustrated by Poona, and which lead to the production of a very bad supply at a very high price:

(1) The animals which are used for milk supply are subject to defects both in the case of cows and buffaloes. In the case of cows, they are not produced for milk, but are in most cases incidental in the production of a breed of working cattle. In the case of buffaloes, though they are primarily produced for milk purposes, the number of really good milking animals or milking strains is decreasing,—and such animals are not obtainable now at all easily. In other words, the amount of milk produced by the animals used is very small for the amount of food consumed.

(2) The animals are kept, in large proportion, where they ought not to be kept, namely inside a big city. They are there in very expensive quarters, under almost necessary insanitary conditions, where all the food has to be carried to them,—where it is in many cases necessary, for economy's sake, to slaughter them when they become dry,—simply because of the difficulty hitherto felt of carrying milk in good condition from any considerable distance. This difficulty can be got over, and, if this is true, milk can be delivered in Poona, as in most other large cities from animals kept outside more cheaply and in a purer condition than by the present arrangements. It seems to me essential to take the cattle out of the cities,—and to arrange to transport milk.

(3) The milk already produced outside is transported to the cities in the crudest, the most expensive and almost the most insanitary manner possible. If the bringing of the milk from villages to the cities can be organised, it can be cheapened, more can be produced by the same people who are now producing it, and better milk will be available in the City.

It seems therefore of vital importance, if the milk supply is to be improved:

(1) that the animals should be improved so as to give a larger amount of milk for the food employed.

(2) that the animals should be in cheap and natural surroundings outside the City instead of inside.

(3) that the transport of milk both from adjacent points by road, and from distant points by railway, should be organised, so that cheaply produced milk should be delivered in the cities in good condition.

With regard to the first of these points, namely, the production and use of a better animal, the difficulties are perhaps greatest, and will take long to solve. For the present, all a dairy owner can do is to take the best breed available, whether of buffaloes or cows, and the best animals among them with the best of male animals for the herd, and ensure that the best is got out of these animals by suitable feeding.

In connection with the development of better animals than are in use at present, my colleague, Mr. J. B. Knight, who has had large experience, has recently expressed himself as follows:—

“The development of a profitable dairy animal from any of the types existing, without outside blood, is the work of generations, working on scientific principles, consistently, intelligently and persistently. The agency for effecting this is difficult to point out. The necessity for continuity in this work is so great that it places it beyond the scope of Government Institutions, because of the necessary frequent changes of personality. The only agency which could undertake this work, with a reasonable expectation of accomplishing marked results does not evince any great interest in work of this character. We refer to the Hereditary Chiefs and Sardars, who have estates adapted to the work, and who if they were really in earnest, could carry on this work from father to son, along fixed lines and accomplish something. If the abovenoted gentlemen could be aroused to form breeders associations and definite ideals laid down, and authentic records of breeding and production kept, some noticeable improvement might begin to appear in 10 or 15 years.”

Till such time as this is done it will be a question of utilising the best of the existing milk breeds and milk animals. That even among existing breeds there are very great differences is shown by the following figures from the records given me by Mr. Knight.

Breed of Animals.	Average yield of milk per annum.	Average yield of best animals.	Maximum yield per annum.
Sind Cows	About 2,000 pounds.	About 3,500 pounds.	4,700 pounds.
Kankrej Cows (Gujarát)... ..	About 2,000 pounds.	About 3,500 pounds.	4,260 pounds.
Gir Cows	About 2,000 pounds.	.....	3,887 pounds.
Jafferabadi Buffaloes (Poona records).	.....	3,500 pounds ...	5,438 pounds.
Delhi Buffaloes	3,000 pounds ...	.....	6,000 to 8,000 pounds
Surti Buffaloes	2,780 pounds ...	.....	5,031 pounds.

The Deccan breeds of both cows and buffaloes give a much less quantity than this per annum.

The question of getting the largest amount of milk from animals kept is largely connected with suitable and regular feeding. Such feeding is very rarely done at present. There is hardly ever any arrangement for the regular growing of succulent fodder, and for its provision in the form of silage during the drier seasons of the year. Without this the best will never be obtained from the cattle kept,—and the milk supply, if it is to be in the greatest quantity and best quality that the animals can produce, must be obtained from a situation where this regular feeding is possible, where growing and storage of succulent fodder can be made, and where the animals can utilise it best in the production of milk. If we look on the animals, as we ought to do, as simply milk-making machines,—the cost of the fodder for each pound of milk produced becomes the vital consideration in the economic success of milk production. At present I am convinced that the production is not economic,—because animals are used giving very little milk, and the feeding is not such as to lead to their giving the maximum amount of milk.

Again, the animals should be in cheap and natural surroundings away from the city. I would do everything to encourage the growth of country dairies or of the keeping of cattle, for milk supply to towns, in villages,—and everything to discourage the keeping of cattle for commercial milk production in the city, at least when a satisfactory supply from outside is arranged for. I think that the provision of Municipal sheds for milk cattle, and all such arrangements, while they may be necessary in certain cases at present to ensure sanitary milk at all, are essentially a move in the wrong direction. The object should be to get the cattle removed away from the City entirely, and transport the milk.

For villages or in fact, for centres of milk production either near or far, the chief question seems to be the organisation of the supply either by large dairies, or by co-operative arrangements for collecting and transporting the milk.

There has been much talk in the last two or three years about the organisation of large dairy companies for the supply of cities. Such large dairies are likely to be successful if located suitably on cheap land with regular water-supply,—with good railway (or road, if near enough) connection to the market,—and if good animals are kept. As an illustration of what can be done in this direction, I may note that the Military Dairy in Kirkee can now and does now place milk in Bombay at a cost of 2 annas per lb. This is of course done because it is a large concern with well selected animals with excellent feeding arrangements, including the regular use of silage when green grass is not available, and with pasteurising and cooling arrangements to ensure that no milk goes bad. With the perfecting of pasteurising, there is no need for such a dairy to be near the city supplied, provided there is a good railway connection; it can be located wherever say within a hundred miles, milk production will be the cheapest and most successful.

Apart from the establishment of large dairies as just suggested the only method of ensuring a pure milk supply at a cheap rate, is the organisation of village production and transport. It always seems to me,—and it really is,—a great pity that such a large amount of labour should be employed in merely taking milk to market, which could be used in tending more animals and producing more and cheaper milk. The whole is a matter of gaining the confidence of the village cow-keepers, and then their organisation. The winning of their confidence is a thing for which no rules can be laid down, but it is an essential preliminary to the organisation of the supply,—either by a middleman who buys it in the village, or better by a co-operative organisation of the milkmen themselves.

I only know one such co-operative organisation in India at present,—at Benares,—and the account of this (which I owe to Mr. Ewbank, Registrar of Co-operative Societies) illustrates its possibilities and also its difficulties. I will quote the account of this by the Registrar of Co-operative Societies, United Provinces, and then give a summary of its accounts for the last half year of 1912. In this account a "Ahir" is simply a cow-owner.

"The Vishweshwar Co-operative Dairy at Benares is an institution started and owned by Ahirs and not by capitalists. To remove at least partially the great complaint about the impure milk supply of the town, the idea of starting a dairy to supply pure and fresh milk was suggested to the Ahirs and some of them took it up. They organised the business with the help of Babu Shiva Mohan Lal, Inspector of Co-operative Societies. A manager was appointed to work under the guidance of a committee of Ahirs, who elected Babu Motichand, a leading resident of Benares as their President.

"The Society was registered in June 1911. The shareholders are almost exclusively the Ahirs, and they have paid Rs. 354 in shares so far. They will continue to buy shares from their savings. No other capital is employed if we exclude the cash credit of Rs. 100 which the Benares Bank has sanctioned and the amount borrowed to build sheds. Sales are made for cash and the sale-proceeds are enough to meet current expenditure and leave a margin for profit. The manager keeps the accounts. There is also a credit branch for advance of loans to the Ahirs.

"That dairy management purchases milk from the individual shareholders (the Ahirs) at ten seers for a rupee. The feeding of cattle and the milking is conducted in the presence of the manager, the headman of the Ahirs, and some servants. The milk is collected in cans, locked up by the manager and carted to the city in charge of the salesmen. The cans have pipes attached to them; the contents can be taken out but nothing can be poured in. One horse cart and one ekka are at present employed for cartage. They take the milk morning and evening to the five shops which have been opened in the various quarters of the city and the milk is sold there to the general public. The rate is eight seers a rupee. Shops have been taken on rent and one salesman works at each shop. The manager goes out from time to time to see how they work and to attend to complaints. There is a great demand for the milk. The crowd at the shops is sometimes as large as at the third class booking offices in large railway stations.

"The dairy is situated outside Municipal limits, about four miles from the centre of the City. A plot of land was taken in the beginning on lease and is still in occupation. An opposition set in soon after on behalf of vested interests; the other Ahirs and professional dealers left no stone unturned to discredit the organisation and to injure it. They spoke to the owners of the shops to eject the salesman, and also to the landholder and his agents not to allow any more land to the dairy. Shops had to be changed or rents raised and the servants of the landholders had to be propitiated. On one or two occasions some Ahirs armed with lathis came to threaten the salesmen at the shops. The landholder and his tenants raised difficulties when they were approached to give some more land for extensions. In this matter the aid of the district authorities was sought through the Registrar of Co-operative Societies and they settled reasonable terms with the landholder and the occupancy tenants. One tenant is still objecting. This is about the only matter in which help has been given by the authorities. No help has been given by the Municipality.

"The success of the dairy was soon noticed. People thought there was a good deal of profit and hardly two months were out when a rival shop was opened in the immediate vicinity. In this case some men combined to buy milk from the Ahirs in the city and put them in cans similar to those of the dairy, rented a shop adjoining the dairy shop and brought the milk there for sale. As they had not to traverse any distance they often managed to reach their shop earlier and customers who did not like to wait bought from them. They had also a comparatively small quantity to sell. The rival shop is now on the decline. A capitalist however who had his dairy at Calcutta and who could not make it a success there is shifting to Benares and some of his cattle have already come.

"The management has found from experience that there is not much profit in this business if it is run on modern lines, but that it can pay its way. In Benares specially even well-to-do people are not willing to pay a little extra price for good and pure milk. The dairy has three ponies and it had to pay on account of their feed, treatment, occasional breakdown and hired labour Rs. 900 during the last year for transport. There were also occasional surpluses of milk which resulted in loss. Dahi or butter is generally made of the unsold milk but they yield much less profit than milk. The surplus is occasional, so it will not pay to engage a permanent establishment to deal with it. An attempt was made to sell the extra milk to sweetmeat-makers at a slightly reduced rate but they are somehow in opposition and are determined not to give any help.

"It has also been found that the best customers are the common people who buy for cash and give no trouble. Formerly the manager made it a point to supply to public institutions and rich men, but delays, deferred payment, the question of commission to servants, etc., came in the way and he has now definitely given up the practice. The manager has also hitherto failed to solve the question of a house to house supply, for Benares is peopled mostly in lanes through which no carts can pass. A sufficient number of customers living in one locality has also not come forward to pay the extra cost of labour.

"The dairy has about 100 head of cattle of which about 30 are dry. There are more buffaloes than cows. The outturn of milk now is nine maunds per day but the quantity goes down in the summer."

Of course this is only a small concern: there are some groups of villages near Poona, for instance, where a larger society could probably be organised than that of which I have spoken. This Benares Society works, however, on a very narrow margin of profit. Its accounts for July to December 1912 showed a gross profit on the sale of 120,700 pounds of milk of Rs. 1,595, and the net profit was Rs. 235.

Perhaps this is not a *brilliant* success,—but it sells pure milk at 8 seers per rupee in Benares, a price at which pure milk is *never* obtainable in Poona.

This organisation of milk production away from the cities, and of transport to the cities does not seem beyond possibility in Western India, whether by large dairies, or by the utilisation of village supply. Exactly the mechanism for doing it will have to be worked out. Neither the data nor the means are available for giving details of such a mechanism. But every evidence exists to show that it can be done.

When it is done, then the time will have come to apply strictly sanitary rules with regard to the milk cattle sheds inside the City, to the quality of milk sold in the streets or in the shops, and generally to bring the milk supply under the sanitary control which is so very essential. Till such organisation has been shown to be workable, without raising the price of milk, then I fear that the supply as at present arranged cannot be interfered with. It is a great pity that this is the case, but anything which tends to raise the present very high price still further would defeat its own object.

In conclusion, I have tried to show the deplorable condition of city milk-supply at present in Western India, the difficulties in improving it, and the methods which seem to offer the most hopes of success. The position is by no means hopeless, but it is difficult, but the data I have put forward will, I hope, lead to a wide discussion of the subject, and to the improvement of one of the very worst conditions in city life in Western India at present.

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**PROGRESS MADE IN THE CULTIVATION OF SUGARCANE AND
THE MANUFACTURE OF GUL.**

Out of the total cultivated area of the Presidency about 60,000 acres are annually planted with this crop in the Bombay Presidency. The principal sugarcane districts are Poona, Sátára, Belgaum, Násik and Surat.

Over two-thirds of the area planted to this crop are irrigated by wells, the balance receiving its water from canals, chief among which are the Mutha and Nira Left Bank.

Although the total area under Sugarcane is small compared with other staple crops, the importance of the industry cannot be judged by this, because, owing to the intensive nature of the cultivation, and the amount of capital invested, the total profits from this limited area compare quite favourably with that from crops having a much larger acreage. The cultivators of the canal area expend from Rs. 350 to 500 per acre and the outturn obtained is from Rs. 400 to 800 according to the season and rate. Thus we see that this is a very remunerative type of cultivation.

The growers of cane on well irrigation do not as a rule expend so much and the resulting outturn is from one-half to two-thirds that irrigated from the canals. Their profits are also further decreased by the extra cost of water. It can be estimated that to irrigate one acre of cane from a well 35 feet deep will cost from Rs. 80 to 100, whereas the canal area provides all the water which the cultivation requires for Rs. 30 to 40 per acre.

It is often stated that the value of manure is not appreciated by the Indian cultivator and that he uses this for fuel rather than for his land. Be that as it may, with the general cultivator, it certainly does not apply to Sugarcane growers of the canal tract, who apply from 30 to 60 cartloads of farm-yard manure and supplement this with a top-dressing of 2 to 3 tons of castor cake or fish which is a heavier application than is given anywhere else in the world to this crop, or very seldom to any other crop.

The soil is very carefully prepared by 2 or 3 ploughings or hand-diggings followed by repeated harrowings. These operations cost from Rs. 25 to 30 per acre at present.

The after-treatment comprising ridging, planting, weeding, watering and earthing up cost about twice as much more, so that the total cost of labour upto harvest will come to about Rs. 90 per acre. The cultivation throughout is pains taking and careful and it is believed will compare favourably with that of the cultivators of this crop in other parts of the world, the greatest criticism being that the cost is excessive.

It is believed that these expenditures of water, manure and labour are unnecessarily large and it has been proved at Manjri Farm that all of these can be considerably reduced by a better system of management. The prevailing methods of working up the product are also wasteful of labour, fuel, sugar and quality of product, all of which can be obviated by the adoption of better methods.

The points for improvement may be considered under 5 heads :—

I. Improvement of cane by selection of better varieties or better strains of Pundia.

II. Improvement in Manuring :—

(a) by utilising waste products of the crop like trash (pachat), skimmings and ashes, by taking green manuring crop as san for supplying the coarse manure, (b) by depending upon concentrated manures for Nitrogen supply to the crop rather than upon natural manures, like farm-yard manure or sheep dung. Among the concentrated manures, the minerals furnish nitrogen at a cheaper rate than the other types and should be used as partial sources of the supply of this element.

III. Reduction of water by means of more carefully levelling and conserving water by inter-tilling.

IV. Reduction of cost of cultivation by using modern implements.

V. The methods of working up of sugarcane into gul are open to improvement from the cutting to the marketing.

I.—SELECTION OF CANE.

(a) *By improved varieties* :—Not much progress has been made in this line of late years. Pundia cane ranks as a moderately rich variety fairly hardy and well adapted to the tract irrigated by canals. Kabirya succeeds better than pundia where the soil is of

exceedingly fine texture and where there is a danger of water-logging but is not so rich a cane as Pundia. The hard varieties, Sannabilli from S. M. Country and Wanshia from Gujerat are more hardy than pundia requiring less water and manure. They also suffer less from the attacks of jackals and pigs. In point of production they are nearly equal to Pundia, but they are more difficult to crush and their juice contains more glucose unless the cane is dead ripe.

The Mauritius varieties both red and green when planted by the Mauritius system ($2\frac{1}{2}' \times 2\frac{1}{2}'$ each way) produce heavier yields of cane than Pundia. Their juice is about one per cent. inferior to Pundia. The growing period of these varieties is found to be two months longer than that of Pundia. They are particularly well adapted for that form of cultivation known as Adsali.

(b) *By better strains of Pundia*:—The outturn from pundia can be considerably improved by the choosing of sets. Sets from good healthy plant canes (1st year) are superior to those from a stunted ratoon crop so often employed. Assorting these sets so as to eliminate all small shrivelled, or otherwise inferior sets will further increase the outturn.

Our experiments have demonstrated that, if only the terminal sets, that is, the three or four internodes or joints of the cane just below, where the leaves (Vadha) has been lopped off, are used for planting, they will produce more vigorous cane than sets from any other part of the stalk. A further gain from this process is obtained on account of the low sugar content of this part of the cane, which when crushed produces poor juice and inferior gul and by its elimination, which occurs when it is used for planting, the juice from the rest of the cane is richer and produces better gul.

An attempt is being made by individual study of pundia canes to find out if their quality is uniform or whether we can take the advantage of any variation which exists to select better canes and establish richer strains of Pundia.

II.—IMPROVEMENT IN MANURING.

When Mr. Mollison commenced the study of sugarcane, his first attention was directed towards the reduction of the amounts of manure and water then given to the crop. In his time he found that the cultivators frequently applied 750 lbs. of nitrogen per acre and while admitting that only 100 lbs. of this element was required by the crop in his first experiments, he recommended 500 lbs. to be used. But later he conclusively proved that it was possible to raise maximum outturns with only 350 lbs. nitrogen. Since his time we have been able to demonstrate that if the water-supply is carefully reduced to almost half, a dressing of manure containing 250 lbs. of nitrogen will produce a good crop of cane.

It is thought that, with more extensive use of improved implements, which mix the manure more intimately with the soil, better methods of planting which reduce the quantity of water and the use of more available forms of nitrogen like mineral salts, the quantity of Nitrogen required to produce a first class yield of cane will more nearly approach that actually taken up by the crop, for in no part of the world is nitrogen so ruthlessly squandered as in India along the canal sugarcane tract.

Manure serves two functions when applied to the sugarcane lands of the Deccan. Because of the abundance of alkaline salts there is a strong tendency for the soils to puddle and become unfit for the growth of crops especially when heavily irrigated. To correct this tendency, large applications of organic matter are required. This is usually given as farm-yard manure and when that substance can readily be obtained for less than Rupee 1 per cart, it is probably the cheapest source of organic matter. But when the price increases it has been proved that green manuring with San will supply the necessary organic matter more cheaply than farm-yard manure.

In the production of gul from cane there is left as a residue about 12,000 lbs. of trash and about 9,000 lbs. megass for every acre. If this is returned to the soil, it will be quite sufficient to keep up the organic matter, but by the prevailing systems of gul-boiling all of these and sometimes even other sources of fuel are required. By improvement in this operation, it is possible to prepare the gul on $\frac{2}{3}$ of these bye-products, so that if the trash thereby saved be put upon the soil, only one-fourth of the usual application of farm-yard manure will be required. Where farm-yard manure is depended upon to keep up the texture of the soil, from 25 to 30 cartloads will be the minimum amount that ought to be applied. In all cases a small dressing of 6 to 8 cartloads of farm-yard manure has a beneficial effect upon the rotting of the other organic supply.

The other function of manure for cane is the supplying of the plant food elements, namely, Nitrogen, Phosphoric acid and Potash. Of these three, Nitrogen is one of the greatest importance to this crop. In supplying Nitrogen and humus we incidentally usually supply nearly sufficient amounts of the other elements. This would be especially true if the ashes from the gurhal are all returned to the plots, and a part of the nitrogen dressing is in the form of cake and fish which contain considerable amounts of phosphoric acid, so that the principal desideratum in manuring Sugarcane after having supplied the organic matter is the question of *Nitrogen*.

Sources of nitrogen for sugarcane manuring may be considered under four classes :—

- (1) Excreta of animals and human beings.
- (2) Oilcakes.
- (3) Animal refuse (Fish and slaughter house refuse).
- (4) Mineral salts.

All the manures except some of the last class, not only are valuable as sources of Nitrogen, but they are useful to the crops as suppliers of Humus, Phosphoric acid and potash. But in this discussion we will only consider the element Nitrogen.

(1) *Excreta of animals and human beings.*

The manures of this class contain about one per cent. of Nitrogen when alone, but they are usually applied mixed with litter or other substances as farm-yard manure or with earth and sweepings as in the case of poudrette, so that the manure applied is poorer than the actual dung. The Nitrogen in these manures requires some time to rot before it is entirely available to the crop. If urine is mixed with the manure as in the case of sheep dung, its Nitrogen will be more readily available. It is an advantage where heavy irrigation prevails to have a part of the Nitrogen in an insoluble form, which will gradually become soluble and keep the crop supplied with that element and the danger of loss through washing be lessened. In supplying farm-yard manure sufficient to keep up to the humus requirements of the crop, about half of the Nitrogen required will be given, but in the case of green manuring and the utilisation of trash (pachat), less Nitrogen is supplied than is required. When farm-yard manure is used, it is recommended that 25 good cartloads of well rotted manure be given. If manure is not well rotted, it will take longer to become useful to the plants.

Poudrette is slightly more active than farm-yard manure but it can be used to take its place. It furnishes about the same amount of Nitrogen.

Sheep folding is a good method of supplying manure. It is difficult to estimate but probably one hundred sheep will be required for about one month to give a dressing equivalent to 25 cartloads of farm-yard manure.

Stable manure is usually diluted with litter so that its Nitrogen per cent. is rather low, but the Nitrogen of horse dung and urine becomes available much quicker than that of cattle dung. It is a mistake to burn off the litter as is frequently done, as the humus in the manure is thereby lost. Coarse manure like this should be ploughed into the soil by a turning plough as early as possible in the season and not later than November when planting is to be done in January.

Where soil has an inclination to become salt, it may become necessary to increase the amount of coarse manure. The well irrigated cane is usually grown on this manure alone, but experiments have proved that use of concentrated manures in part increases the yield and the net profits, even with well cultivation.

(2) *Oilcakes.*

There are quite a number of oilcakes at present available in the markets to the cultivators, of which (a) castor, (b) safflower, (c) groundnut, (d) niger, (e) cottonseed, (f) karanj are the principal ones. The value of any cake depends almost entirely upon its nitrogen content.

(a) The castor cake at present available is mostly mill-pressed from Gujerat and Bombay. Its Nitrogen content is from 3 to 4 per cent. It is readily available and when used, the crop ripens rather earlier than with some of the other manures. This ensures that the juice will be purer than if the cane is crushed while unripe and the gul will be of good quality. Castor is said to have a beneficial action against white ants. When used with 25 loads of farm-yard manure about 2 tons or 8 khandis of this cake are required.

(b) *Safflower cake.*—Two types of safflower cake are available in the market mill-pressed and country ghani. There is some prejudice against the former as it is slower acting. Safflower cake analyses from 6 to 7 per cent. of Nitrogen which is readily available to the crop. Safflower cake seems to have a beneficial effect upon the production of cane, not explainable from its Nitrogen content. The quantity of the cake required for top-dressing is about 1 ton or 4 to 5 khandis.

(c) *Groundnut cake.*—This is a very rich cake containing 6 to 8 per cent. of Nitrogen and also considerable Phosphoric acid and Potash. When used as a top-dressing about one ton or 4 to 5 khandis are required.

(d) *Niger seed cake.*—This contains 5 per cent. Nitrogen and a dressing of a ton and a half or 5 to 6 khandis is necessary.

(e) *Cotton seed cake*:—There are two kinds decorticated and undecorticated. They contain 6 and 4 per cent. nitrogen respectively. This is comparatively a new manure and more experiments with it are required.

(f) *Karanj-cake* is the poorest of the lot. It has insecticidal property like Castor. A dressing of about 2 tons is required.

(3) *Animal Refuse.*

Fish manure:—Several kinds of fish manure are available, one known as chingli is considered the best. These are whole fish 2 inches long largely imported from Muskat (Persian Gulf). It analyses from 8 to 9 per cent. of Nitrogen. In this form it is more difficult to adulterate than the fish meal, so that chingli generally contains less sand than other types.

Tarly:—These are fish about 4 to 6 inches long. They are dried in the sand and contain a considerable amount of sand. The Nitrogen per cent. is about 6.

Dhoma is from a bigger fish and is in broken form in the market, giving opportunity for adulteration. Its analysis is 8 per cent. Nitrogen.

There are several other kinds in the market. In purchasing fish manure, great care should be taken that it is adulterated as little as possible. The Nitrogen in the fish is very quick acting and cane ripens early. Besides furnishing nitrogen, it supplies the soil with Phosphoric acid. When given as a top-dressing about a ton is required.

Hyma or slaughter house refuse:—A large amount of manurial material is lost to India from slaughter house refuse. It is at present dried and exported. It should be utilised by the Sugarcane growers because it is richer than any other manure referred to and the Nitrogen is quicker acting although, not subject to waste like that of the minerals.

(4) *Minerals.*

There are two classes Sulphate of Ammonia and the Nitrates.

Sulphate of Ammonia contains about 20 per cent. Nitrogen very quick acting. It is well adapted to our soil, and by its use larger crops can be obtained than from any other manure, but it is not wise to use more than three cwts. per acre. If this is given in combination with half the amount of cake usually applied as a top-dressing, good results will ensure. Sulphate of Ammonia is not so easily lost by drainage as the Nitrates.

The principal nitrates available are those of Soda, Lime and Potash. These manures are not so well adapted to sugarcane cultivation as the Ammonium Sulphate, since they may have a detrimental physical action upon the clay of the soil and also because they are subject to greater loss through drainage water.

Nitrate of Soda or Chili Saltpetre contains about 15 per cent. Nitrogen. When used in small quantities as a top-dressing to stimulate the growth of the crop in parts of the field, where for some reason the cane is smaller than elsewhere, it is useful. But when put on in the usual way it does not give as high return per unit of nitrogen as sulphate of ammonia.

Nitrate of potash or Crude Nitre:—This works better on our soils than the Soda salts, and some benefit from the potash is probably obtained. This manure is obtained in the form of the Crude Nitre analysing from 5 to 12 per cent. but at present the price puts it out of question.

Nitrate of Lime:—This is a new manure containing about 13 per cent. Nitrogen and is very promising, Nitrates like Sulphate of Ammonia should not, however, be used in large quantities or there will be a loss. Four cwts. used with cake or fish will give best results.

The statement below shows the name of manure, its Nitrogen content, market rate, the amount to be applied, Nitrogen furnished by such a dressing and the cost per lb. of Nitrogen:—

No.	Manure.	Nitrogen per cent.	Market rate per ton.			Quantity to be applied per acre.	Total cost per acre.			Nitrogen furnished.	Cost per lb. of Nitrogen.			Remarks.	
			Rs.	a.	p.	Tons.	Rs.	a.	p.		Rs.	a.	p.		
1	Farm-yard Manure ...	0.7	6	8	0	11 or 35 Cart-loads ...	71	8	0	200 lbs. N.	0	5	6	Before planting in addition to top-dressing.	
2	Poudrette ...	1.0	11	4	0	9 or 25 Cart-loads ...	101	4	0	"	0	8	0		" "
3	Sheep-dung ...	1.0	11	4	0	6.7 or 25 Cart-loads ...	75	6	0	"	0	8	0		" "
4	Stable Manure ...	0.5	5	8	0	13.4 or 50 Cart-loads ...	73	12	0	"	0	8	0		" "
5	Castor Cake ...	4.0	65	4	0	1.72 or 8 Khandis ...	112	0	0	150 lbs. N.	0	11	8	Given as top-dressing.	
6	Safflower Cake ...	6.5	93	4	0	1.03 or 4.8 Khandis ...	96	0	0	"	0	10	3		" "
7	Groundnut Cake ...	7.0	65	4	0	1 or 4.5 Khandis ...	65	4	0	"	0	6	8		" "
8	Niger Seed Cake ...	5.0	46	12	0	1.3 or 6.25 Khandis ...	60	12	0	"	0	6	8		" "
9	Cotton Seed Cake ...	5.0	46	12	0	1.3 or 6.25 Khandis ...	60	12	0	"	0	6	8		" "
10	Karanj Cake ...	4.0	37	4	0	1.7 or 8 Khandis ...	64	0	0	"	0	6	8		" "
11	Fish ...	7.0	84	0	0	1 or 4.5 Khandis ...	84	0	0	"	0	8	7		" "
12	Slaughter-house refuse ...	10.0	60	0	0	13½ Cwts. ...	107	4	0	"	0	11	5		" "
13	Sulphate of Ammonia ...	20.0	265	0	0	6½ "	89	12	0	"	0	9	7		" "
14	Nitrate of Soda ...	14.0	280	0	0	9½ "	133	0	0	"	1	0	0		" "
15	Nitrate of Potash ...	12.0	168	0	0	11 "	92	8	0	"	0	10	0		" "
16	Nitrate of Lime ...	13.0	200	0	0	14½ "	144	0	0	"	0	11	0		" "

To sum up the manurial question:—Sugarcane crop requires manures furnishing organic matter equivalent to 25 cart-loads of farm-yard manure, which may be supplied as Green manuring, Trash, Stable manure, Poudrette, Farm-yard manure or Sheep folding. When manures other than dung are given, a slight dressing of 5 cart-loads of farm-yard manure is imperative. The above manures should be supplemented by 50 to 150 lbs. of nitrogen as concentrated manure in the form of cakes, animal refuse and so on. It is better if composed of both minerals and cakes or animal refuse. It is essential that all the manures except the Nitrates be applied a considerable time before they are required by the crop. This is especially true of the course manure which should be applied before ploughing. All manures should be reduced to as fine condition as possible and intimately and thoroughly mixed with the soil.

III.—REDUCTION OF WATER COST BY BETTER CULTIVATION.

The crop of Sugarcane contains 14 to 15 tons of dry matter. Experiments have proved that plants require from 400 to 600 lbs. of water to produce one lb. of dry matter so that to produce a sugarcane crop, 75,000 tons of water are required. This is equivalent to 75 inches of rainfall or 272,250 cubic feet of water a little more than half the quantity that is usually applied. What becomes of the other half? Part of it is lost through carelessly constructed bunds, part escapes through sub-surface seepage and the rest is evaporated from the surface. The figures given above are for actual requirement of a full crop while double the amounts is the average usually applied for average crops, which are much below a full crop, so that the waste is even more than that shown. Full benefit is not obtained from all the water applied due to irregular applications. The first essential in saving water is to have the compartments or *wáfás* as nearly level as possible so that it is not necessary to overflow one side in order to give sufficient to the other. Loss from breaking of bunds is largely due to using two big streams for irrigating, as the water rushes through the compartment without having time to soak into it.

Careful and deep preparatory tillage of the field fits the soil to hold a large amount of water. A single application should never exceed the quantity which a soil can hold without seepage and the applications if necessary should be more frequent, especially in shallow soils. If a system of planting is adopted, which permits of stirring the soil as soon as the land is workable, after each irrigation and a mulch produced, evaporation will be checked and the interval can be considerably lengthened. This is more applicable to the later stages of the crop when the roots have become well spread throughout the soil. It should be remembered that it is the water held like water in a cloth (capillary water) which benefits the cane and not that which stands like water in a bucket.

The amount of water required should vary with the age of the crop. I estimate from 25 to 30 irrigations are required including each rainfall amounting to one inch and over. During the first three months the cane should receive water at intervals not less than eight days in application of but only about an inch and a quarter. The next three months, the interval may be 10 days and the amount given 2 inches. During the 3rd and the 4th quarters, the interval may be gradually lengthened to 15 or with intertilling to 20 days, and the amount given increased 3 inches, if the bunds are able to hold that amount. This gives a total of about 2½ lacs cubic feet of water which is enough to produce 30 tons of cane. If larger crops are expected, the water must be increased accordingly.

There is an intimate relation between the amount of water used and manure required and when heavier applications of water are given, more manure must be applied. It is doubted whether the maximum possible crop is the most economic. Where water is drawn from a well, the cultivators do not attempt to raise the immense crops obtained on the canals. It is only the low price of water which enables canal cultivator to use and often waste such extravagant dressings of manure.

IV.—REDUCTION OF COST OF CULTIVATION BY USING MODERN IMPLEMENTS.

The cost of ploughings offers the first opportunity for reduction. The country plough requires four pairs of bullocks to plough one-third of an acre in a day. But from the nature of its construction the furrow made will be V-shaped with the apex downwards thus leaving between one furrow and another a volume of soil untouched equal to the amount ploughed so that it really ploughs one-sixth of an acre per day. The ploughing does not invert the soil to any considerable extent, nor is its pulverising action comparable with that of the western plough. Because, of these deficiencies in this implement, it becomes necessary to go over the area again and again to secure the required condition of pulverisation. If a turning plough of proper pattern be used, one ploughing will suffice. This can be done at the same cost of draught and time as a single ploughing with a country plough, but the Western plough on account of the nature of its construction ploughs all the land and pulverises and mixes to a considerable extent, so that a second ploughing becomes unnecessary. The reduction of the furrows to the proper tilth can then be effected by Disc harrow and cultivator. These implements are more economical of draft and time than the log harrow and country blade harrow at present used. By the use of these improved implements, the cost of preparatory tillage can be reduced to one-half the usual expenditure.

Improved ridging implement like Planet Junior ridger makes better ridges at a less cost than the usual method. By planting by the row system the weeding and earthing can mostly be done by the same ridging implement.

The Row System.—In this system deep furrows are ploughed out at a distance of 4 to 5 feet; four lines of cane sets are planted in one furrow. This makes the seed-rate about as usual. The irrigation water is sent along at first in the furrow and the inter-spaces cultivated with the Planet Junior. After all the weeds have succumbed to this treatment, the ridging attachment is put on the implement and earth turned up against the cane. The irrigation water is then allowed to flow between the furrows. After each irrigation the interculturing is performed. The essentials to this system of planting cane are level land or long slopes in rather long stripes with the irrigation water applied in small streams extending over several hours.

Harvesting will also be facilitated; possibly a machine harvester can be used.

While we have not as yet authentic figures to prove the total net gain for this method of growing cane, we estimate that the water requirements will be from 10 to 20 per cent. less, and the manure proportionately less. The preparatory labour as has already been stated is one-half; the labour of weeding, earthing and watering more than one-third less than usual and we see no reason why the outturn should not be equal to that of the old system, since a larger number of shoots per guntha has already been observed.

V.—METHODS OF HANDLING THE OUTTURN.

The methods almost exclusively prevailing of working up Sugarcane for market are very crude, as compared to the improved methods used in Sugarcane factories of other parts of the world, where capital has made it possible to utilise powerful machinery, thereby saving much sugar and labour. But even in those countries cane is exclusively cut by hand and improvement begins with carting of the cane to the central factory.

Where the area is small, the bullock mill and the open pan are used. Packing the cane on men's backs to the mill, which is usually situated very near the field, seems to be the only possible method; but when the area is increased and two or more mills with their accompanying pans are required to work up the outturn, some better labour-saving methods of transporting the heavy cane must be sought for.

Loading into the carts of usual pattern is difficult, and if the fields are soft, only small loads can be taken. Low down trucks with wheels 6 inches broad can be made for about Rs. 150, by means of which large loads of cane can be taken over the soft land very easily. As the area still more increases, light rails and trollies reduce the cost further. These rails cost about Rs. 3,000 per mile including trollies and turn-tables. To be most efficient and labour-saving, these should be placed along the field and moved twice daily as cutting progresses.

Crushing.—The extraction of juice was formerly performed by stone mills something like the country oil ghani. The first improvement was the introduction of crushing between wooden rollers geared together and rotated by a long crank shaft, to which bullocks are attached. This no doubt was a vast improvement in time and efficiency. Sometimes two and sometimes three rolls were used. The next stage was the replacement of wood by iron. Wooden mills are still found in many parts, but wherever any considerable amount of cane is grown, they are fast disappearing.

This improvement has resulted in an increase of 14 per cent. in the outturn of juice from a given amount of cane, which means a gain of 75 rupees per acre. Further improvement has not been attempted on a large scale.

There are several different types of iron mills, varying slightly in details of construction and capacity, but practically of the same efficiency. The type known as Poona mill is as good as any. The Nahan mill does not excel the latter in any respect. It has less capacity and costs more.

A horizontal roller mill, known as Pearl for sale by Messrs. Clubwala and Co., Bombay, was tested at the recent demonstration and gave great satisfaction. It gives about 8 per cent. more juice, turns off 6 pans a day, requires no more bullocks, and requires less labour to feed it than the Poona mill.

Power-crusher.—Wherever the area under Sugarcane under one control exceeds 25 acres or wherever that amount of cane can be obtained through co-operation within an area of two miles square, the power-crusher will easily pay interest, depreciation and a handsome profit. It not only extracts about 7 per cent. more juice over the bullock mills, dispenses with four-fifths of the labour, and saves fodder worth Rs. 30 which is generally fed to the bullocks of gangmen, but, on account of its greater capacity, the cane can be crushed when at its maximum richness and because all the work can be located at a central point greater supervision reduces the petty pilfering. It may be estimated that the savings from these various sources amount to fully Rs. 100 per acre. To offset this we have interest and depreciation which may be taken as Rs. 12 to Rs. 15 per acre.

Boiling.—The more primitive type of furnace is a circular pit 10 feet diameter at the bottom, narrowing at the top to 7 feet and 6 feet high with one door from top to bottom which serves for feeding, inlet for air egress of smoke and removal of ashes. The pan used in connection with this furnace is made of thin iron, and is 7 feet diameter at the bottom with sides $1\frac{1}{2}$ feet high, flaring outwards. With the furnace of this description the combustion must be very incomplete and the fuel requirements excessive. This is found to be the case, since furnaces of this type require an extra expenditure for fuel besides the megass and trash furnished by the crop of Rs. 30 per acre. In the canal area of Poona is found a decided improvement made in furnace construction. This consists principally in the construction of a two-storied furnace, the lower storey serving as an ashpit and being reached by a subterranean passage from outside which serves to supply draft to the fire. The two stories are separated by a sheet of iron which is perforated by an opening of 9 inches square. The upper chamber is 7 feet in diameter and four feet high, and has a door which serves for feeding the fuel and escape of smoke. The pan used with this furnace is much shallower than that of the other type. The combustion in this furnace is so much more perfect, that the megass and trash from one acre of cane furnish abundant fuel for converting juice into Gul without seeking any outside source.

At Mánjri Farm, the question of improving this furnace has been under investigation for several years and series of improved furnaces have been evolved by the combined efforts of Mr. P. C. Patil, G. R. Mahajan and the writer of this article. These furnaces are known as Double, Triple and Multiple. The principle on which they are based is the utilisation of the heat contained in the waste gases and smoke from the combustion of the fuel of an ordinary Poona furnace. In construction, they consist of one or more typical Poona furnaces with a flue constructed at the back, by which these gases are conducted to a second furnace under another pan, which is used for storage. In the Triple form there are two Poona furnaces with a flue from each leading to the third pan. In the Multiple furnace there is another flue leading from the third to a fourth. In all these, exhausted and cooler gases finally escape through a chimney which by its height causes suction of the gases from the furnaces. Some other slight modifications, such as grates in place of the iron sheet with a square hole and a door to the furnace have been made. The results of using these furnaces have been very satisfactory in point of saving fuel, time, labour and improvement of the quality of the product. The Double furnace is adopted for Sátára and it saves $\frac{1}{4}$ th of the fuel and $\frac{1}{4}$ th of the time over the old furnace. The Triple furnace is well suited for Sholápur and saves $\frac{1}{4}$ th fuel and $\frac{1}{4}$ th time. Multiple is suited for power-crushers. Its capacity is from 12 to 14 pans per day of 12 hours, which enables it to deal with the output of a small power plant and it uses less fuel and requires less time and labour than either of the others.

The quality and quantity of the Gul obtained is largely influenced by the condition of the cane at the time of harvest as to ripeness. The country method of making a trial boiling does not give exact results. If after the cane appears to the eye to be ripe, some half dozen canes are crushed weekly and the juice tested with a saccharimeter; the most profitable stage for crushing can be found by noting when its highest reading is obtained. The cutting of unripe or over-ripe cane is a wasteful process. The next factor in the quality question of cane, is thorough skimming of juice. Loss of juice from this process is considerably minimised by use of a scum strainer which returns the juice direct to the pan. Uniformity of product is secured by taking each pan from the fire at the same temperature, which can be easily learnt by the use of the thermometer. The temperature varies according to the quality of the juice but should be the same for the same lot of cane and is from 115° to 118° C.

Sugar.—The question of the production of the Sugar rather than Gul is constantly being raised but so long as the price of Gul keeps equal or ahead of that of sugar, we cannot see any advantage in the more difficult and expensive process of Sugar manufacture over Gul-making.

Experiments with the Haddi process of Sugar-making at Mánjri have demonstrated conclusively that so long as the price of Gul remains above Rs. 16 per palla (243 lbs.) and sugar does not go above Rs. 9 per maund, Gul will be more profitable.

Marketing.—Question of marketing Gul is closely connected with that of financing its cultivation. There is a great chance of co-operation in this line. The competition, however, among the commission brokers in Poona, insures the producers from any great loss due to incorrect weighing or valuing. Their commission is usually upon weight but it ought to be collected upon value.

In conclusion, we see that the experimental work has demonstrated that the amounts expended for manure, water, and labour, could be considerably curtailed, if more carefully managed, without reducing the output, and a considerable saving could be effected in harvesting. Much remains to be done in demonstrating these improvements in such a way that they shall be generally taken up by cultivators of this crop.

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THE CULTIVATION OF ORANGES AND ALLIED FRUITS.

In this paper we propose to deal with the cultivation of oranges, limes and pomeloes, the plants usually grouped under the name of Citrus fruits, as these are grown in the Bombay Presidency. On first tackling this subject three years ago we found very little accurate information available. We propose, therefore, to give in brief what facts have now been gathered as the results of experiment and observation here, and study of experience in other countries. There is an increasing number of enquiries regarding the cultivation of Citrus fruits and the area under Citrus in the Presidency is increasing. That the area, though small is increasing, is shown by the figures in the table given below:—

Areas reported to be under Citrus in the various districts of the Presidency.

District.	1901-02.	1906-07.	1911-12.	Increase per cent. in ten years.
Poona	949	1,016	1,628	71.5
Ahmednagar	Not available.	466	433	—6 in 5 years.
Sholapur	34	34	105	208.8
Násik	67	110	145	116.4
Sátára	16	21	33	106.2
Gujarát	Not available.		190	
Karnátak	"		42	
Konkan	"		33	
Sind	"		484	

3,098 Total acres.

This area of 3,098 acres grows not only the orange but other allied fruits. The total area under all kinds of cultivation in the Bombay Presidency including Sind is 39,908,000 acres of which only the above small fraction is under Citrus. The population of the Presidency and Sind is 27,084,317, that is, if the Presidency were to depend for Citrus fruit on itself, 8,742 people would have to get their Citrus supply from one acre. The necessarily resulting shortage of supply is made up by imports from outside especially from Nágpur, East Africa, Italy, Hong-Kong, Turkey (Asiatic Ports in the Persian Gulf), and Persia. The value of Citrus fruits imported from places outside India into Bombay during 1911-12 was Rs. 884. Besides these fruits, there is also a large import of jams, jellies, candied fruit, and Citric acid. There is thus in the already existing demand, a fairly large field for the extension of Citrus cultivation and with the expansion of the demand, the possibility of export and the manufacture of preserves and preserved fruit, the future is hopeful indeed.

CITRUS VARIETIES.

The following are the Citrus varieties cultivated in the Presidency:—

Oranges.—Botanical name, Citrus aurantium. Santra, Musumbi, Kavla, Ladu, Reshami.

Limes.—Botanical name, Citrus medica. Mahalung (Citron), Kagadi Limbu (Sour lime), Sakhar Limbu (Sweet Lime, Jamburi).

Pomei oes.—Botanical name, Citrus decumana. Popanas (the Pomelo).

Let us take up these fruits one by one and see their possibilities. First let us consider the general structure of a Citrus fruit. It is a spherical or egg-shaped body with a yellow tough skin which encloses many small segments that come apart from each other. Each segment encloses many pulpy hairs that contain the sweet or acid juice that gives the fruit its value. Each segment also contains one or more seeds except in the seedless varieties. The advantages of this form of fruit are, the resistant skin, the pleasant colour, the thirst-quenching and health-giving qualities of the juice, and the ease with which the fruit can be packed and the time it will keep.

Oranges.

Of these the Santra is the most popular. It is recognised chiefly by the loose skin and golden yellow colour. The origin of the term Santra is obscure, some asserting it comes from the Sanskrit, and others that it is a corruption of the name of a Portuguese town, Cintra. It is a sweet edible variety, popular with everyone, and its cultivation is largely timed by growers so that the fruits come into the market about Christmas. Its price in the Crawford Market, Bombay, during 1912-13, varied from Re. 1 to Rs. 2 per dozen. It is cultivated to a great extent in Sáswad, and also in the north of the Poona District.

Musumbi orange.—This is the tight skinned orange usually called sweet lime by Europeans. The name Musumbi is supposed to be a corruption of the word Mozambique.

Its taste is less piquant than that of the Santra. Its cultivation is usually found alongside that of the Santra. Its prices are from annas 12 to Rs. 2-8 per dozen. In the neighbourhood of Ráhuri in the Ahmednagar District, the cultivation of Musumbi is greater than that of Santra.

Kavla.—The skin is loose with irregular vertical ridges and with a circular ring at the apex. The juice is scanty and the flavour bad.

Ladu orange.—The shape is flattened from apex to base. The skin is loose and the fruit has a papilla at the stalk. Colour unattractive. Juice is sweet and the fruit is almost seedless.

Reshami.—The skin is loose and of a crimson gold colour. The fruit is useless for trade on account of its small amount of juice; the taste is bad. It occurs by accident in several gardens.

The Kavla and the Ladu are no in demand and there is no separate cultivation of them. They occur here and there in gardens of Santra and Musumbi which are the important varieties.

Limes.

Mahalung (Citron).—This is wrinkled, pointed and exceedingly acid. Separate cultivation of it is rarely practised. It is used for pickles and preserves. Its retail prices are from one to three annas each.

Kagadi Limbu (sour lime).—This is the small round lime used for drinks and with curries, etc. Separate plantations of it are found in Citrus-growing areas. Its prices in the season are 6-7 annas per 100.

Sakhar Limbu.—This is the true sweet lime. It is little seen and is of no special importance. It has an unattractive taste.

Jamburi.—This fruit has a thick wrinkled skin and spherical shape. It is very acid in taste. The plant is useful as a stock on which to bud oranges.

Pomeloos.

There are two varieties of these in this Presidency, one with white pulp and one with red pulp. The fruit is large and spherical and has no ridges. It weighs from 5-10 lbs. Some varieties have no seeds. Moderate sized fruits fetch 4-6 annas each, but fancy prices can be obtained for specially good fruits.

SOILS SUITABLE FOR CITRUS CULTIVATION.

Citrus plants are very accommodating. Unless the surrounding conditions are exceptionally unfavourable the trees generally do fairly well in all soils. The suitability of the soil will be best understood if we know what the trees do *not* like. Heavy soils through which water does not percolate easily, or which are constantly moist, should not be selected. Similarly, very light soils in which water is not held for some time will not suit Citrus trees. Another condition which the trees will not tolerate is a layer of impervious rock at a short distance below the surface of the soil and yet we have seen a plantation near Sinhagad where the surface soil was only three inches deep, and below that was hard compact murum. It is hopeless to expect success in Citrus cultivation on such soil. In another plantation the rock was one to one and a half feet deep only. In both cases the plants were doing badly. In the case of a plantation where there is a depth of a foot or two of soil and then hard rock, the plantation will do apparently all right for a year or two or even more, according to the depth of the soil. Then the flowers will commence to fall off on account of the unhealthy condition of the roots which have now struck the impervious layer. They can get no further, can draw on no fresh supplies of water and are liable to be in stagnant moisture in the soil above the rock. Soil which has become salt owing to over-irrigation without drainage, is also fatal to trees as we have seen in our practical experience. So much for the soil conditions that are not suitable for the growth of Citrus.

In the Deccan, typical orange growing soils are (1) medium black as in Poona, Sáswad and surrounding villages, (2) Reddish alluvial soils on the river banks as found in some of the plantations in Junnar Táluka in Poona District, (3) Loamy white soils as found at Ráhuri. All these soils are very retentive in nature, and about five feet or more deep. In the neighbourhood of Rájewadi, gardens also flourish on soil 3 feet deep with murum sub-soil. Besides these soils there are many more Citrus soils that have intermediate shades of colour. The most important factor to be taken into consideration by the Citrus grower is how far the soil is naturally drained. Different varieties have different requirements as to drainage. Musumbi plants will stand a much more retentive and less drained soil than Santra plants. Santra plants require a much severer rest than Musumbi to make them fruit. One of the reasons why Sáswad is famous for Santras is that a number of small rivers rise from the Purandhar hills and flow heavily in the rainy season. In their brief life they often wash away large blocks of soil, thus leaving behind small islands. The level of these

islands is sometimes ten feet above that of the river beds. On such islands many of the orange gardens are situated. Whatever be the nature of the soil, water does not remain for a long time. Hence, when water is cut off for resting the trees, the effect of the stoppage is very quickly seen. Thus at Sáswad three to four weeks' rest is quite sufficient for Santras, but in the reddish alluvial soils, six weeks' rest is necessary. On poorly drained soils where even six weeks' rest can have only a slight effect on the plants it is better to put in Musumbi. It is worth noting that Mahalung plants suffer severely from flooding.

So far we have considered the nature of soils in the Deccan only. The Deccan soils are certainly highly suitable for orange cultivation. Will it be a logical conclusion that the Konkan soils are unfit for orange cultivation? We have seen some authors remark that oranges will not grow in the Konkan, but actual facts are against this remark. A small garden of orange trees is situated in the village of Wawoshi, ten miles from Khopoli station in the Kolaba District. The garden is the property of Mr. Tilak. It is located in a valley enclosed by hills on three sides and open towards the south. A small trench is dug between the western hill and the garden. This prevents washing of the soil in the rains, and at the same time secures good drainage. The rainfall of this place is in normal years 125 inches, and rarely comes below 100 inches. The soil is derived from trap and is of yellowish colour. It is four feet deep. Below it is a bed of murum but no hard rock. The fruit is of a fairly large size, and in flavour compares favourably with the Poona Santra. The skin however lacks the characteristic colour, but this should not discourage orange cultivation in the Konkan. There is, however, one point to which the attention of orange cultivators in the Konkan may be drawn. If we compare the analysis of virgin soil with the analysis of the orange garden above referred to, we find that the top soil of the garden is more or less exhausted, and needs a good dressing of farm yard manure. The exhaustion of the soil is chiefly due to continued cropping and to washing of the soil by heavy rains.

We give as an appendix, analysis of various Citrus soils in the Presidency. In this connection we may remark that, while lime is an essential ingredient of all good Citrus soils, there is little fear of its being in defect in the Deccan soils all of which show a good proportion of that element.

While dealing with soils we may remark that Citrus fruits grow splendidly on the alluvial soils formed by the shifting rivers on the plains near St. Vincent's Gulf in South Australia. The rainfall there is about 20 inches. A rich deep red colour is got in the Citrus fruit. Well and tank irrigation is practised. Citrus lands cost £50 per acre and upwards. Irrigation settlements along the Murray river in Australia are also places where the oranges do well.

"Varieties of Citrus grow upon the sticky adobe soils of Mesopotamia, upon the alluvial soils of the lower Mississippi, upon the fertile soils of the West India Islands, upon the dry soils of Arizona and California and upon the almost sterile sandy soils of Florida. There is probably no other genus of fruit trees in which the species are so plastic as to adapt themselves to almost every possible gradation of soil. It should not be inferred, however, that every variety of the genus can be grown upon all of these different kinds of soil. For it is absolutely necessary to choose the particular variety which is adapted to any peculiar soil"—U. S. Farmer's Bulletin 538.

CLIMATE.

As to climate the only question of practical importance that comes into view in this Presidency is the question of growing Citrus in the heavy rainfall districts. In all the other districts of the Presidency oranges will grow well, other conditions being right. We have already given a case of a successful orange garden in a place with a rainfall of 125 inches. Further data on the point from this Presidency are wanting except in the case of pomeloes which can certainly be grown in the Konkan with success.

The fact that oranges of excellent quality are grown on the Khasia hills in Assam in a very heavy rainfall ought to prevent us from making any assertion that orange cultivation will fail in a similar rainfall here.

Frost is such a rare phenomenon that it may be neglected and yet as it occurred in Poona in 1911, it may be as well to remark that the Citrus trees in the Ganeshkhind Botanical Garden did not at that time suffer at all from the frost. This may have been due to the fact that the trees had been watered just before the frost came. Citrus trees are, however, known to be considerably frost resistant and no fear need be felt on that score in this Presidency.

PROPAGATION.

Propagation by seed of Citrus trees is not desirable in this part of country. We have seen by actual sowing of the seed of Nágpur orange, Musumbi and Reshami oranges that seedlings of these plants are exceedingly thorny; in fact there is hardly any leaf without a thorn. On the other hand these same plants when budded on Jamburi or any other

(although the stock be thorny) do not produce thorns. After careful examination of fifty budded Santra plants we have found two plants having two thorns each. Musumbi plants do occasionally have thorns, but these are very rare and the plants may be said to be practically unarmed. Absence of thorns is a great advantage in this fruit tree as danger of puncturing the fruit is minimised, and harvesting the fruit is facilitated. Also digging, manuring and pruning can be done with less trouble.

Another reason for the non-employment of plants on their own roots is that they will often not stand the same severe conditions as the stock used. For example, Musumbi seedlings in Ganeshkhind Botanical Garden were flooded by rain last year in July for about three hours. The effect of this flood was harmful to the Musumbi seedlings, for the bark of the part that was under water decayed in a very short time, leaving the wood of the stem completely exposed. The result was that the plants turned yellow and sickly. Jamburi plants which suffered the same flooding did not suffer at all. This shows that Musumbi plants will not do on their own roots where such a flood is possible.

The next question that arises is what stock should be used. We have so far attempted budding mainly on four different kinds of stocks, namely, Mahalung, Jamburi, Reshami, and Nagpur orange; besides, Pomelo, Poona Santra, and Musumbi have been tried to a smaller extent. Jamburi is the stock already commonly used and for general purposes it is certainly the best. Citrus buds of all kinds on Jamburi surpass in growth similar buds on Musumbi though the latter are six months older.

We shall now point out the most essential characters in a stock. The stock should be of good round stem about half an inch in diameter. It often happens that a plant is put out in good soil, is receiving the best of attention as regards water and manure, still it is not making good progress and never yields good fruit. It is difficult to account for its bad health. In such cases the trouble may be due to either bad scion or bad stock. Thus arises the necessity not only of budding but of choosing the right kind of stock and scion. Now to consider the stock. Whatever stock you choose, collect the best fruits ripened on the tree and allow them to rot for some ten days. When sufficiently soft, extract the seeds and bury the pulp in the manure pit. Of the seeds select only the plump and well developed ones. A good method of selection is to place the seeds in water. Those that come to the surface should be rejected. Those that go to the bottom are mostly safe for sowing. The seeds should be sown immediately, for their germinating power does not last long. The seeds should be sown either in boxes or beds that should be protected from the hot sun. Seedlings when about five inches high should be transplanted into beds. When transplanting, the main root should be cut short. This ensures good sound side roots and the removal of budded plants becomes much more easy. Seedlings should be transplanted at a distance of eight to twelve inches. This ensures sufficient space for budding operations, and also prevents much branching of the stock from the base. Young stocks should be allowed to go straight and the lower ten to twelve inches should be kept clean of side shoots. The part above this should be allowed to branch freely. These branches serve to protect the scion from the heat of the sun. For budding purposes the stock should be about half an inch in diameter. With suitable watering and manuring this condition will be reached in not more than eighteen months. The bark should be easily separable from the wood below, it should be soft and pliable and the inside mucilaginous. The external colour of such a bark is deep green closely streaked with whitish grey lines. These conditions are found when the sap is vigorously flowing in the plant. When the bark cannot be easily separated from the wood below or when it is dry inside, it is futile to attempt to bud. Desirable conditions are to be seen in the stock in the beginning of the rains (June) and in the cold weather (December, January, February). Referring again to the stocks experimented with, the bark of Mahalung stock is somewhat brittle and less mucilaginous and the sap-flowing condition lasts only for a short time. Reshami is not at all suited as a stock, for the bark closely adheres to the wood below, and is dry inside. With Pomelo as a stock the great difficulty is that it does not stand transplanting when about an inch in diameter. Nagpur orange stock, when cut off above the bud in the usual way to force the bud to grow, often turns black above the bud, and this is a dangerous thing in a stock. The Jamburi stock is free from all these faults.

In choosing the scion we must first have regard to the general character of the tree, and choose scions from a tree that is a heavy yielder of fruits of good quality. In choosing the actual branch from which to cut the buds we must look for the same characters of roundness, lack of thorns, and flow of sap as have just been mentioned in the case of the stock. Each bud is cut off by slitting the bark in a rectangle and round the bud half an inch above and below the bud and one third of an inch to each side of the bud. It is then eased off and kept moist till insertion in the stock. The bud should be inserted on the stock about six inches from the ground. The cut for the bud is simply two cuts in the form of a T and the bark eased back to allow of the insertion of the bud. The bud is firmly tied in with *sopat*, i.e., the inner part of the plaintain leaf sheath, and a small flap of *sopat* tied so as to shade the bud. After a month or less the bud begins to grow out into a branch. The stock is then cut off about six inches above the site of the bud, and the whole of the stock above the bud is cut off when the branch from the bud is

eight inches long. After this, care must be taken to rub off all buds that show any tendency to develop from the stock below the site of the bud. There must at no future period be any part of the tree produce branches except the scion.

The Citrus varieties that are usually budded in this Presidency are all the Oranges, Santra, Musumbi, Ladu, Reshami and Kavla, the Pomelo, Mahalung, and Sakhar Limbu. Kagadi Limbu is not budded but there is no reason why it should not be budded. We have budded Kagadi Limbu with excellent results as to size of plant and hope in a year or two to be able to show that improved fruits result from budded trees. Only thornless buds should be used. Plants from such buds of Kagadi Limbu give trees with fewer thorns.

After the scion has produced a branch of not less than a foot long the plant may be transplanted into its permanent place in the field. The distance apart at which the plants should be put out is still a matter of debate. American authors recommend distances that seem enormous to those accustomed to the methods in vogue here. For example 25 feet is recommended as a suitable distance. We are not yet in a position to pronounce definitely on this subject but for the meantime we would recommend those who can experiment to do so by putting out groups of trees at different distances. The bulk of their plantations however should, until the question is settled, be planted at 14 by 14 feet in the case of Santras, and wider in the case of Musumbi and Pomeles. In the case of Kagadi Limbu 10 by 10 feet will do. The pits for the plants should be three feet each way and the earth mixed with about 100 lbs. of farmyard manure. It is desirable to support the tree in its new place by tying it to a stake till it gets hold of the earth for itself. The scion branch should also be tied to the stake to prevent the wind wrenching it off. In planting, the bud should face the side from which the wind blows otherwise the tree will grow lopsided.

Treatment of Plantation.

While the stocks have been grown and budded the soil of the plot selected for the permanent plantation should have been receiving attention. It should have been ploughed, harrowed and levelled. Care should be taken to remove all roots of Kunda (*Ischaemum pilosum*) and Hariali (*Cynodon dactylon*). Care should also be taken to dig out all nests of white ants in the field or in its neighbourhood and to destroy the queen ant in each case.

The pits should be made in the hot weather previous to the planting of the budded plants. If the soil be fairly good, intercrops such as brinjals, onions and chillies should be taken for two or three years between the citrus trees. After that time the citrus trees should have the whole plot to themselves. If the trees are very healthy they produce fruit in their fourth year, but as a rule they should be cropped for the first time in the fifth year. The trees flower in January (Amba Bahar), June (Mrig Bahar) or October (Hatti Bahar). One of the two first flowering times is usually taken, as the trees require the cutting off of water and resting before each flowering and this is not so easy for the Hatti Bahar. The whole process of resting and the times at which it should be done are given in leaflet No. 9 of 1912 of the Department of Agriculture of Bombay.

For trees which have already commenced to bear fruit the usual water supply should be gradually lessened when half the crop is gathered, so that by the time the last gathering of fruit is completed the surface soil is fairly dry. Two weeks after the last irrigation each tree should be carefully pruned of its dead and weakly branches. The whole plot should be ploughed or hand-dug and mixed manure of cow-dung, ash, household and village refuse should be given about three baskets to each tree. This manure should be thoroughly mixed with the soil and spread over the whole bed. The time of manuring the trees should be about 10 to 15 days before the first irrigation. The roots should be opened and young fibrous roots near the stem should be cut off. By the time the operations are completed the trees show a tendency to drop their leaves. In retentive soils considerable dropping of leaves is necessary, while in open elevated soils this is not absolutely necessary. The first watering should be scanty, just sufficient to moisten the upper surface of the soil. This stimulates the formation of flowers. Copious watering at the first irrigation tends to produce leafy shoots. The second watering should be given two days after the first; and the third watering four days after second; and after that irrigation should be given in the usual manner according to the needs of the plants. On the fourth day after each watering, each bed should be hoed to produce a fine mulch on the surface of the soil. This is essential for conserving moisture in the bed. Cracks in the soil are thus prevented and young roots are not exposed to the heat of the sun.

Now as to which of the first two bahars is the best to take depends very much on the market for which the crop is grown. We should like to have the experience of growers as to whether they notice any great difference in either quality of the fruits or the period of time it takes to ripen fruits of the two bahars.

Diseases.

A diseased plantation at Arvi in the Junnar Taluka was examined by us in 1912. The symptoms of the disease were the yellowing of leaves and dying of branches. The

diseased trees occurred in patches here and there. The fruits of the trees were small. The yellowing of the leaves began by the appearance of whitish dots on these organs. In the soil around the diseased trees succulent weeds such as are usually found on salty soil were found. Analysis of the soil showed a large amount of salts (see No. 9 in analyses given at end). The well water which was being used to irrigate the plantation was not salty. This was a clear case of accumulation of salts in the surface soil due to lack of drainage. The only remedy in a case of this kind is to dig trenches round about the diseased trees at every ten feet. The trenches should be three feet deep and 1½ feet wide and should have a common sloping channel to the nearest nulla. Such trees as are hopelessly gone should be removed and the salt washed out of the soil round the rest by repeated waterings.

So far we have been troubled with no fungus disease of citrus trees in this Presidency. In the case of scab on the fruits fungi are usually found associated with the marks, but these are by no means proved to be the cause of the disease and McAlpine of Australia, who has investigated this disease to a considerable extent is inclined to believe that the punctures of an insect are the first cause of the disease.

Scab is not very common however. I regret that we have no remedy to offer for it at present but we shall be glad to have specimens of the disease to investigate whenever it occurs.

A variety of insects attack the citrus trees. One of the worst is the Aphis known as Mowa in the vernaculars. The tiny insects cluster on the young shoots and suck the juice out of them. We have found that the best remedy for this insect pest is a spraying of tobacco solution. Two pounds of tobacco are boiled in two gallons of water for half an hour, and one pint of soft soap is added to the mixture. This is the stock solution. Dilute with seven parts of cold water.

The caterpillar of *Papilio demolens* is also a serious pest when the plants are young. It eats the young leaves. Handpicking of the caterpillars is the only remedy.

A boring insect penetrates the trunks of trees especially in neglected plantations. This insect can be killed by a stiff iron wire and the hole filled up with wax.

White ants should have been cleared out of the plantation before the trees were put in, but if any attack occurs after the trees are set the remedy is the same—find the nest and dig it out, killing the queen.

The caterpillar of *Arbela tetraonis* feeds on the bark under a shield of a webby material composed of silk and excreta. It is nocturnal in its habits. It does not however do much damage. The spraying of the stems with crude oil emulsion is recommended.

A common disease of obscure origin is that popularly termed Sursa. The fruit shows punctures and falls off the tree. This is probably due to the bite of a nocturnal insect but the insect is not yet discovered. If any grower can assist us to find out what the insect is we shall be most grateful.

Aspidiotus ficus is a scale insect that produces scale-like spots on the fruit. The remedy for this spraying with rosin wash prepared by boiling two pounds of rosin and one pound of washing soda together in water till dissolved and mixing with water up to eight gallons.

Another obscure disease is a browning of the fruit called Tambera. The cause of this is totally unknown as yet. Any observations by growers as to the time of attack, the spread to all the trees or not, the immunity or otherwise of varieties will be very welcome.

Manuring.

As to this we have no definite recommendations as yet to make. Very definite results have been got in America and other citrus-growing countries as to the value of different manures. We are at present testing these recommendations in Ganeshkhind Garden on the trees there, but as yet no conclusive results have been obtained. If any grower wishes to experiment in his own plantation on the manuring of citrus trees we shall be glad to have his assistance, and we shall draw up for him a scheme of manurial experiments that will give definite results in a few years.

For the present we can only recommend the usual practice of putting farmyard manure and ashes on to the roots mixed with earth before starting watering after the resting period.

Pruning.

Similar remarks apply to pruning. Experiments are being made. For the present we can only recommend the cutting out of all diseased branches and dead branches and the tarring of the cut surfaces.

In 1905 trees of Nagpur orange were planted in Ganeshkhind Garden. These grew luxuriantly but produced no flowers. These were heavily or moderately pruned in May 1910. All the trees whether pruned heavily or moderately put out shoots with double

vigour in June and July of that year but no flowers were produced. In some cases the shoots were not pruned but bent. In these cases new vigorous shoots came up from the exposed centre. As a rule shoots came up on the outer side of the curve formed by the bending. Twisting of the branches alone was found to check new growth, but did not result in the formation of flowers. In the following year the plants fruited well but not distinctly better than those that had not been pruned, bent or twisted.

Notching below a leaf checks the growth of its axillary bud for some time. The removal of a small ring of bark of a branch probably tends to kill the part above the ring. Buds below the ring are favoured at the expense of the whole shoot.

An experiment was in 1911 made on certain Nágpur orange trees to see if flowering could be forced in trees that were giving small crops. The method was to root prune three plants of a row, expose the roots for four days, fill up the holes again with earth, and give water. The result was as desired and copious flowering resulted. Many of these flowers however fell. It is to be noted that the method here employed was much severer than that used at the time of resting the trees for the *bahars*. In the experiment above cited the whole of the ball of roots was exposed and pruned, while in the resting for the *bahars* only a few of the surface roots are exposed.

In January 1912 an experiment was made in Poona in the renovation of a neglected orange plantation of about 16 years standing. The methods employed were pruning all dead shoots and large dying branches, (2) removing diseased portions of the trees, (3) thoroughly clearing the area under the trees. These operations were carried out in February and March 1912. The cut surfaces of all wounds were tarred, borers and grubs were searched out and destroyed. Several of the worst trees died under treatment. The result of the experiment on the rest, however, was satisfactory, for in the month of June the flowering was excellent. The results of the experiment were spoiled by a flood that submerged the whole plantation for 30 hours and destroyed the flowers. This flood was due to the unprecedented rise of the adjacent river.

Introduction of new Varieties.

In this department also we are only beginning work. The demand in this Presidency is for the present for the known varieties Santra, Musumbi, etc. We are however experimenting with the much-praised Washington Navel Orange. In the matter of introduction of new varieties it is necessary to go slow as the variety that suits one place may not suit another. This is the case with the Washington Navel itself. To quote the U. S. Department of Agriculture Farmers' Bulletin, 538 "As an illustration we have the Bahia or Washington Navel Orange which is pre-eminently adapted for California but is of little value in Florida or the West Indies, where it produces only a small crop."

Here again is a field where any private grower can with profit make some experiments and we shall again be glad to advise as to these experiments.

The profit and loss of a Citrus Plantation.

We shall be glad if growers will favour us with their experience as to—

1. The cost of starting a plantation and running it up to the time of the first crop.
2. The annual expenditure and revenue per year after the first crop.
3. The duration of a plantation.

Packing.

This has as yet received no attention from us. The local method is to pack in baskets with leaves or grass.

W. BURNS,
Economic Botanist.

H. P. PARANJPE,
Assistant Economic Botanist.

Name of place the soil from which was analysed.	Silicates and Sand.	Lime.	Nitrogen.	Potash.	Phosphoric acid.	Organic matter.	ftones.	Magnesia.	Salts.	Remarks.
1 Wáwoshi, Dist. Kolába ... { Surface soil ...	50.14	1.46	0.031	0.31	0.16	0.85	...	...	...	} Orange garden.
... { Sub-soil ...	60.92	1.90	0.081	0.85	0.23	2.22	...	...	...
2 Ganeshkhind Botanical, Garden, Kirkee, Plot No. 6. { Surface soil ..	49.00	5.49	0.051	0.97	0.13	1.57	2.60	...	...
... { Sub-soil ...	50.00	5.04	0.071	0.85	0.11	1.54	5.00	...	...
3 Ganeshkhind Botanical Garden, Plot No. 15. { Surface soil ..	49.36	9.63	0.078	0.81	0.17	1.83	Nil.	...	...	.
... { Sub-soil ..	46.33	3.14	0.061	0.41	0.10	2.28	12.50	...	...
4 Mr. Tátyásáheb Vaidya's Garden at Nirguda, Dist. Poona. Surface soil ...	54.84	0.90	0.070	0.39	0.11	1.38	2.00	...	...
5 Arvi, near Junnar ... Surface soil ...	56.58	2.46	0.081	0.47	0.22	1.43	3.40	...	...	Musumbi garden.
6 Arvi, Mr. Chaganlál Marwadi's land. Surface soil ...	55.24	2.80	0.073	0.78	0.16	1.20	Nil.	...	...
7 Baramati, Mr. Rámchand Malukchand's Garden. { Surface soil ..	51.90	4.37	0.045	0.39	0.16	0.99	12.90	...	...	} Santra garden not yielding good fruit.
... { Sub-soil ...	49.38	3.70	0.054	0.27	0.13	1.53	14.40	...	...
8 Mr. Rámchand Malukchand's Garden, Baramati. { Surface soil ..	47.66	6.83	0.042	0.50	0.08	2.26	8.20	...	...	} Musumbi garden.
... { Sub-soil ...	46.60	8.28	0.042	0.58	0.08	2.37	10.4	...	...
9 Arvi, near Junnar ... { Surface soil ...	...	6.09	...	...	...	2.16	...	1.45	.54	} Diseased garden of Santra trees.
... { Sub-soil ..	...	5.86	...	...	...	1.07	...	1.77	.52	
10 Arvi, near Junnar ... { Surface soil ...	...	5.00	...	...	...	1.58	...	0.25	0.11	} Santra garden.
... { Sub-soil ...	...	4.45	...	...	...	1.01	...	0.32	0.09	

THE SCOPE FOR THE USE OF PUMPING PLANTS AND BORING MACHINES IN THE PRESIDENCY.

My object in presenting this paper to the Agricultural Conference is to draw attention to the great advance which is being made in the Bombay Presidency in the practical application of mechanical means to assist agriculture generally, and irrigation in particular.

The subject is a very comprehensive one, and embraces many sections of engineering, anyone of which, is too great for me to deal with effectively within the compass of this paper.

Nevertheless I propose to take what I consider to be at this stage, the most important section, *viz.*:—Irrigation: There are many subjects embodied even in this one, which it will be impossible for me to include, but I will endeavour to lead up to one of them; which is *Boring*. Now *these* are sections of agriculture which could easily be considered apart from each other, and each take up a separate paper, but from an agricultural standpoint they are inseparable.

Therefore I think it will be profitable for us to look at a few particulars in connection with irrigation from a cultivator's point of view.

It should be remembered that irrigation by means of pumping has made enormous progress in many parts of the world notably in America and Egypt; and perhaps there has never been a better opportunity for the introduction of suitable pumping machinery in India than the present one, because there is no question about the demand for the products of the land; the only thing for the cultivators to consider is how best to irrigate their plots, and so produce suitable crops, and thus meet the demand of various markets.

We are dealing with an Indian problem, hence the watering of the crops is more or less essential.

Now in this connection it must be understood that it is not my intention to flatly condemn the use of motes, and advocate the substitution of power pumping in every case; because I believe there are some instances where the mote is practically indispensable; on the other hand, I am fully convinced there are hundreds of cases where the installation of a small oil engine and pump would be highly profitable; and although the cost of lifting water for irrigation by mechanical means depends very largely upon the continuity of the supply, and number of days of the year in which water is supplied, especially in the case of wells, still there is a great field for this particular class of machinery.

With oil engines and pumps the cost of irrigation varies considerably, and for small schemes of from 20 to 50 acres, it may be taken that irrigation will cost from Rs. 60 to 75 on the 20 acres, and on the 50 acres from Rs. 30 to 50, the reason I have taken such approximate figures, is owing to the fact that there are no two sites alike, and this is a point that must not be overlooked.

Now for the sake of comparison I give an instance which will show the superiority of oil engine and pump over mote:—

A certain cultivator having three acres of sugarcane was by means of mote paying Rs. 100 per acre per annum, but having a large area which required irrigating and hearing of the possibilities of pumping, made the necessary enquiries with the result that instead of being restricted to three acres, and paying Rs. 100 per acre for watering, he can now irrigate 30 acres and only pay Rs. 42 per acre per annum including depreciation and repairs.

I am thinking seriously of preparing a diagram showing the relation between head, acreage and cost; although the proper way to obtain the best results is to design a plant to suit each particular case; this of course necessitates expert advice at the time of installation, nevertheless, the extra time and cost taken up at this stage, will be amply repaid by the satisfactory running of the plant at a time, when it is most essential to ensure a profitable return for the capital expended.

This is a fact recognized by most of the cultivators, and the wisdom of such a proceeding acknowledged by them, even if they had to pay an advisory fee, which, fortunately for them, is not required; because Government have appointed me expressly for this purpose.

It is perfectly clear then, that the question of getting expert advice is no longer a trouble.

It only remains for the cultivators to submit their applications and the necessary advice is rendered free of charge.

Then if the site is suitable any enterprising cultivator who can prove his need for help, and offer a reasonable security, Government will advance him a sufficient amount of capital to instal a power plant at 6½ per cent. interest.

Judging from the number of enquiries which I have received for pumping plants I have no hesitation in saying that interest in this class of work is steadily increasing and the cause of this interest cannot be restricted to one source.

The great rise in the price of food stuff, which is accompanied by an equivalent, and even greater rise in labourer's wages, has compelled the cultivators to cast about for other means than the motes for irrigation purposes.

Unfortunately there still exists a sort of prejudice or shall I say "doubt" in the minds of some of our Indian friends about the efficiency of the oil, or gas engine and centrifugal pump, and it is my ambition to try and eradicate these doubts.

What I consider to be a difficulty is the ordinary cultivator's inability to keep his pumping plant in working order after it is designed and erected.

I have been able to trace the cause of a serious breakdown, and the enforced idleness of a modern pumping plant, for a period of two months, at a time when water was most needed, to the fact of the owner's inability to put even an ordinary daily trouble right.

I refer to the simple operation of applying a suitable lubricant to an important bearing.

Of course it is said that the *drivers* should put these matters right, which is perfectly true, they should; but in nine cases out of every ten, the driver does not know even how to attend to the duties required for starting and stopping.

This is a real difficulty and one which must be overcome before irrigation by means of power pumps can be generally adopted by the cultivators.

Another instance of this difficulty, and one which caused considerable damage, happened at a site where repairs were being executed.

The driver had instructions (during the temporary absence of the fitter) to put a cover on the pump, which was a very simple operation, in doing so he actually hammered the end of a new impeller spindle with a steel hammer, and in consequence damaged the most important part of the pump, instead of getting a piece of wood and placing it between the hammer and spindle.

Still another instance, and one which I regard as the simplest I have ever known in the whole of my experience, was where the owner of the oil engine had engaged a fitter to clean the engine, grind in the valves, and make the necessary adjustments; which he was supposed to have done, but was unable to start up the engine afterwards, and nearly two days were spent in pulling the engine round and heating the vaporizer; but the worst part of it was that the crops which consisted of sugarcane were withering in the hot sun.

I happened to be in that vicinity at the time and went to his assistance, and was able to locate the trouble and start up the engine in less than 30 minutes, the difficulty was, that when cleaning, the fitter had accidentally altered a set pin on the exhaust lever.

It will be obvious from the three cases stated above that a real difficulty *does* exist, both as regards the cultivator, the driver, and the fitter and to my mind the *only* one; and to overcome this difficulty, I have proposed the establishment of a training school and workshop which is now being erected in the Agricultural College Grounds, Poona.

In this school prospective power plant owners can receive the necessary instructions to enable them to run their own plants properly, and also put a temporary stoppage right, without having to send to Bombay for a man, and at the same time run the risk of having their crops spoilt during the waiting. Evidently this will tend to minimise the difficulty which has hitherto been a great drawback in the way of the cultivator anxious to instal a pumping plant.

But now he has advice given him; if he can produce a suitable security then Government may advance him the necessary capital; he can have his machinery ordered and erected by this department at a reasonable cost and in addition he can be instructed how to attend to his plant properly when erected, or have a driver whom I have recommended; and as to the comparative cost—well, if he can get 30 acres irrigated for Rs. 40 or less per acre per annum, where before he only had 3 or 4 acres which cost Rs. 100 to 120 to irrigate, I think the evidence is overwhelming in favour of a power plant.

Moreover with the advent of crude oil as a fuel, the cost per acre per annum will be still less, as the efficiency of this class of machine is almost assured now at the rate of one anna per 8 B. H. P. per hour, which means that a 8 B. H. P. oil engine can run on full load for one hour for the insignificant sum of one anna; and for 240 days of 8 hours a day the total cost for fuel will be Rs. 120.

My office during the last three years has replied to about 350 pumping enquiries which proves the great interest being shown in this class of work.

Closely associated with irrigation is the subject of boring, which I am pleased to be able to say has received an impetus owing to the introduction of a machine recently invented by my predecessor Mr. Musto.

Hitherto hand-boring has been considered practically impossible in the Deccan owing to the very hard formation of the trap-rock, but now it is quite within the range of

possibility. I have taken trials in two cases already and given the machine a severe test, which proves that the boring is not only possible but practicable.

The successful working of the oil engine and pump on river sites has revived interest in the augmenting of the source of supply in wells; and in the improvement of existing wells boring plays an important part. Hence the advent of a machine which will bore through rock is naturally hailed with delight.

By means of this new machine it is quite possible to put down an exploratory bore-hole, and so determine the nature of the surrounding rock: sometimes the bore-hole taps fissures carrying water under pressure and materially increases the flow into the well: sometimes it reveals beds of porous rocks which only require opening out to yield a copious supply.

Now in the case of hard rock having a supply mainly in fissures, the insertion of a charge of high explosive will, it is hoped, be the means of increasing the supply, after a bore has been made, and in this connection the new machine will be highly efficient in making the bore previous to inserting the charge.

Blasting therefore, if successful, will be a boon to the cultivators generally throughout the Deccan.

I have received 41 enquiries in connection with boring during the last six months which proves that the interest shown in this class of work as applied to agriculture is increasing rapidly.

Unfortunately the idea generally prevalent in connection with wells is that a huge excavation is absolutely necessary. But in some cases, particularly when dealing with soils, it has been proved that this is not required. Now instead of making a hole 15 or 16 feet in diameter to a depth of 30 to 40 feet if we take a bore direct from the surface and insert a convoluted tube well and arrange the pumping gear, we can dispense with a lot of unnecessary labour. These tubes of $3\frac{1}{2}$ " in diameter are capable of delivering upto 5,000 gallons per hour, and the approximate cost is $\frac{1}{4}$ th of the ordinary wells of equal capacity, and with the larger sizes the difference between the cost of tube wells and wells of equal capacity is much more marked.

If the tube is required to augment the supply of water to an existing well a tube estimated to yield the nearest quantity of water above the amount required can be inserted in the bottom of the well.

This method is shortly to be tested in Gujerat; therefore it would be manifestly undesirable, not to say futile, to enter upon any detailed argument concerning the technical factors at this stage, especially as we are on the eve of a practical demonstration.

There is evidently a great future for Indian Agriculture, if improved machinery and implements (which are continually being introduced and of course are the result of Engineers' untiring efforts to produce labour-saving tools) be constantly used and manipulated in a practical way.

The more mechanical appliances are used the less will the cry of poverty be heard.

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THE DEVELOPMENT OF CO-OPERATION IN AGRICULTURE.

There are many people who hold the opinion that the Co-operative Credit Societies' Act of 1904 passed during the Viceroyalty of Lord Curzon constitutes a veritable boon to the great mass of the Agricultural classes of India. The success already achieved by the movement which that Act inaugurated is truly phenomenal. The new Act of 1912 has enlarged the scope of the movement and rendered possible the organisation of societies for purposes other than credit. In almost all the European countries, co-operation applied to agriculture has become a great economic power and raised the small farmer to higher productive efficiency. In those countries co-operation has been pressed into service, not only for providing cheap money, but also for ministering to almost every distinct want of agriculture—for instance buying, selling, providing power, drying roots for longer preservation, improving breeds of live-stock, insuring farmers' property against almost every variety of risk, converting produce into more marketable shape, pressing grapes, distilling potatoes, and so on. Moreover, a study of agricultural progress in those countries would doubtless show that the communities of small farmers or peasants could not withstand the stress of modern competition unless they had recourse to co-operation. India is eminently a country of small farmers or rayats and seems to be specially marked out for the practice of all forms of co-operation. The benefits which the practice of co-operation confers upon cultivators are so tangible and so far-reaching that agricultural reformers generally resort to it as one of the most effective and readiest methods of improving agriculture.

2. In any scheme for the improvement of agriculture through the development of co-operation, Credit Co-operation or Co-operative Credit should necessarily command the first place among all forms of co-operation adopted. In this Presidency, we have at present more than 500 Credit Societies. It is a matter for satisfaction that some of our societies can compare very favourably with the best of societies elsewhere; what is more important, however, is not the number of societies that we have got, but the knowledge we have now gained, through experience, of conditions which should obtain precisely in places where only it will be possible to organise good societies. If we want to start a society at a village, it should have at least 30 to 40 cultivators for whom the rate of interest charged by the sowkar is pretty high and who are willing to join the society. They should have character and also some property; there should also be 5 to 10 substantial people at the place who are sympathetic towards the co-operative movement and willing to advance it by depositing money in the society and working for it. Now, for the work of organising societies at suitable places, we want a very large number of our educated people to take an interest in the co-operative movement; and if all those professing an interest in the movement work sincerely and assiduously for it, it will not take many years before the whole countryside is covered with a net-work of Credit Societies. There are some people who urge that no society should be organised unless all the members composing it understand the principles of co-operation and deplore that rural illiteracy is the greatest bar to the spread of the co-operative movement. My experience is a little bit different; and I have found that if a few members understand the principles of society management and identify themselves with the success of the society, the general body of members gradually come to understand the working of their society. It is the material benefit itself which the society so tangibly confers upon its members that gradually leads them on to an understanding of what they practise.

3. I attach the utmost importance to the organisation of Co-operative Credit in rural areas. Even in Germany, which is the foremost country in Europe in respect of Productive and Distributive Co-operation, it was Co-operative Credit—the command of money—which gave all other co-operation the start, stimulating the taste for it and providing the means with which to set it up. I look upon an ordinary Rural Credit Society as a school where the rayat may be drilled and disciplined in order to fit him up for practising other forms of co-operation eventually. In many cases Co-operative Credit has given proof of its remarkable power of suggesting and generating all other forms of co-operation. It was only the other day that I was urged by the members of a successfully managed Credit Society in the Thána District to help them in organising a Co-operative Seed Society and drawing up a scheme for cultivating the members' lands on a co-operative basis.

4. It seems to me that the time has now come, not only for pushing the organisation of Rural Credit Societies forward, but also for starting pioneer societies in respect of other forms of co-operation.

5. In the case of Co-operative Manure Supply, two societies have been already registered and are in working order. I am in full knowledge of the working of one of them—the Kelva-Máhim Manure Supply Society in the Thána District. That Society consists of 97 "panmali" members who have already collected a share capital of Rs. 2,500. The first consignment of castor cake required for garden cultivation by the members was sold to them at Rs. 18 per khandi, when the dealers' rate per khandi in the Máhim bazar was Rs. 22. Later on, the dealers thought it wise to reduce their rates. In that way, the Máhim Manure Supply Society has achieved a very desirable result. The rate of interest charged by the Society on the price of cake sold on credit is 9½ per cent.

whereas, the dealers' rate of interest is from 18½ to 25 per cent. As regards the dealers' peculiar methods of business, the panmalis have long complained that they use short weights, palm off old useless cake as fresh cake and purposely dump their cake on sand and sometimes even mix it with the latter. The Máhim Manure Society has already proposed to double its capital share and extend its operations. The initial success achieved by that society has reached the ears of the panmalis in the neighbouring Bassein Táluka and the people of Váthar and Agáshi are now proposing to organise Manure Societies in their respective villages. The total volume of oil-cake required every year for garden cultivation in Bassein and Máhim Tálukas alone is to the value of over four lakhs of Rupees. I expect that in the course of a few years the *panmalis* of those two Tálukas will organise themselves co-operatively, not only for purchasing their requisites such as oil-cake, but also for disposing of their garden produce. There seems to be a very extensive field for the organisation of Co-operative Manure Societies in almost all the canal and well-irrigated tracts of the Presidency where cultivators require large outlays of money for manure.

6. There is also considerable scope for another class of societies, *viz.*, societies for supplying seed and food grains to cultivators. Next to the need of loans at easy rates the need that is undoubtedly felt most acutely by the small cultivator is the need of good seed on reasonable terms. Only the more substantial ryots store their own seed; those who are poorer and more backward usually have to obtain it from their sowkar on such terms as he chooses to impose, with the result that they get bad seed at an exorbitant price. I have found a certain system of loans in kind called *waahi-didhi* to exist in the Thána and Kolába Districts, according to which the sowkar exacts, and the cultivator has been accustomed to repay 1½ maunds of paddy at harvest time for every maund of paddy advanced for food in the beginning of monsoon. If however the paddy is advanced for seed, the sowkar takes 2 maunds for every maund of loan. We may form village Seed Societies in exactly the same way as village Credit Societies; but with this difference that in the case of a Seed Society the capital is maintained in seed instead of cash and loans are also made in seed. If a Seed Society charges "savai" rates or 25 per cent. increase in kind, it will do sound business and be able to supply properly selected and stored seed to its members.

7. The quantity of grain cultivators borrow for seed on the *wadhi-didhi* system is not so large as what they borrow for food. In some villages of Karjat Táluka I found not less than 75 per cent. of the cultivating families borrowing paddy for food every year in the beginning of monsoon and repaying it with the customary increase at harvesting time. The establishment of co-operative societies at suitable places, for advancing loans of paddy to cultivators at savai rates, not only for seed, but for food purposes, will doubtless produce a striking change in their economic condition and free them from the grip of the sowkar in a few years. Let us take the case of a cultivator who has been borrowing for "khavti" or food 16 maunds of paddy every monsoon and repaying 24 maunds at harvest time. If he borrows paddy from a Co-operative Paddy Society at savai rates, he will in the fourth year of his membership of the Society, be practically free from the necessity of borrowing paddy at all. In the first year, he will borrow 16 maunds as he was used to do in former years; but will repay to the Society only 20 maunds instead of 24. So in the second year, he will have to borrow only 12 maunds and repay for it 15 maunds. In the third year, he will borrow 7 maunds and repay 8½ maunds to the society and as he will thus save about 16 maunds for the use of his family in the fourth year, he will be under no necessity to borrow paddy in that year. In future years, he will save more and more and grow stronger and stronger in his economic position. We are aware of the noble and strenuous efforts made by the Hon'ble Mr. Orr in the Thána District for organising paddy societies which had for their ultimate object the annihilation of the system of *wadhi-didhi*. I am sure there is a very large field for the organisation of societies of the type now described, not only in the Northern Konkan, but also in other parts of the Presidency.

8. There is yet another type of societies which may be organised with the object of securing steady and profitable market for the producers of milk and ensuring pure milk supply to towns. There is now a movement a foot in Kalyán Táluka for co-operatively organising the "Agri" cultivators who produce milk and supply it to Bombay. Within a distance of 2 miles from Kalyán and Dombivli stations, there are at least 500 cultivators who keep in all about 1,000 buffaloes. As each cultivator takes his milk separately to Bombay, the cost of marketing the milk is out of all proportion to its value and he therefore adulterates it with water. It is quite possible to give an impetus to the development of the milk industry of Kalyán Táluka by organising Co-operative Milk Supply Societies among the Agris. A Society may be started for a group of 5 or 6 adjacent villages and a milking shed put up at a central place within the group to which the members may be required to bring their animals for milking by a trained man kept by the society. The man kept by the society will be one who will do milking and handle milk under sanitary conditions and the members' milk will be marketed by the society. We have heard of the success of the Benares Vishweshwar Milk Supply Society started by Ahirs and we also know that the question of pure milk supply to towns has become a problem of almost national importance. I therefore urge that we should now organise Co-operative Milk Supply Societies at suitable places, on the lines of the Benares Society with the object of supplying sanitary milk to urban populations.

9. So far as the co-operative obtainment of power is concerned, very little seems to have been attempted in this country. In those districts with which I am connected, I find there is considerable scope for the employment of power on a co-operative basis for at least one kind of work; and that is the hulling and polishing of rice. The present practice of preparing cleaned rice from paddy in Konkan for domestic consumption is no doubt economically wasteful. An average "pandharpesh" family has to hull annually 3 to 4 khandis of paddy. But there are also other families which consume every year even 15 to 20 khandis. Two or more coolie women are employed for a day practically every ten days or fortnight for preparing cleaned rice required for the family. If in a large village or within a radius of two miles there are about 100 pandharpesh families which together consume annually 400 to 500 khandis of their paddy, then an oil-engine, rice hulling and polishing machinery and a shed may be put up for about Rs. 3,000. The capital may be raised by issuing, say, 300 shares each of Rs. 10 and if the members agree to send all their paddy for being hulled and polished to their Co-operative Rice Hulling Society, they will be starting a sound and profitable co-operative concern. I read in the papers that in Madras too, the co-operators are taking up the question of forming Co-operative Rice Hulling Societies in villages. The field for such societies in the Konkan Districts is very large and I hope that some pioneer work will be done in the course of the current year.

10. There are also other types of societies which may be organised at suitable places; we may organise co-operative sale of cultivators' produce; we may purchase co-operatively agricultural machinery for common use; we may start co-operative stores; we may establish co-operative depôts for collecting eggs and transmitting the same to centres of consumption; and so on.

11. The co-operative organisation of cultivators throughout the length and breadth of the country will benefit them in a variety of ways. They will get cheap money for financing their operations; they will realise the best prices for their produce; they will obtain the best quality of requisites at the cheapest rates; and will be able to employ up-to-date machinery. But they will also achieve other indirect but equally tangible results. First of these I may put the development of mind and character; the cultivator practising co-operation will acquire a new out-look and his moral horizon will enlarge itself. He will gradually come to appreciate the working of democratic institutions—for, the constitution of a co-operative society is most democratic—and will exert his influence in public affairs for public good.

12. We know that little country of Denmark consisting of small farmers or peasants like our own country, which has, after a crushing defeat in war and loss of territory, raised herself in the course of 40 years to a height of agricultural prosperity unprecedented in any other country. We further know that the success of the Danish cultivator who has the reputation of being one of the most successful in Europe is largely due to co-operation, not only in credit, but in every branch of his activities. What I now venture to urge on you is that an increasing number of our educated people should come forward and identify themselves with the co-operative movement and overspread the country with a network of societies; and if we do so, there is not the slightest doubt that the progress of agriculture in the course of 40 years since the passing of the Co-operative Act of 1904, will form a brilliant chapter in the economic history of Western India.

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USES OF IMPROVED IMPLEMENTS IN FARMING.

On comparison of the statistics of the last 50 or 60 years, one finds that a vast change has taken place in the cultivated area and population of the Bombay Presidency. All the available good area has been brought under the plough. Not only this, but even inferior sort of soil has been under cultivation. The population has increased faster than production, and owing to various reasons the prices of staple food-grains have gone up high, and have indirectly affected the labour market.

How is this to be remedied? The cultivable area cannot be increased as there is very little suitable area available except in some districts, like West Khándesh. The only remedy is better farming. This means the production of larger outturn with less expense, and that without injuring and impairing the fertility of the soil. This can be accomplished by the use of improved methods of soil management and improved implements. Every farm operation must be performed by efficient and labour-saving appliances. It is not possible to increase the outturn at once, but if efforts are made in the right direction the cost of production can be reduced to a large extent. Labour is getting dearer day by day, and this is mainly due to the dearness of prices and a great demand which has arisen owing to the industrial development, which has taken place during the last few years. The mill industry has increased in Bombay, Ahmedabád and several other towns. Hydro-electric schemes, irrigation canals, and several other constructions are attracting the farm labourers, where they get better wages than from the farmers or from their own lands. The landless class is increasing year after year and is flocking towards industrial towns. The result of all this has been inferior and inefficient cultivation and reduction of outturn. One of the ways of tackling the problem of raising crops at a small cost can be achieved to a large extent by using improved implements such as ploughs, sowers, hoes, mowers and winnowers, etc.

There are several varieties of soils found in this Presidency varying much in depth and texture. To treat these severally different kinds of implements are needed. The most valuable cultivation is that given before sowing. No rule can be laid down for the cultivation of the soil. The time for ploughing and the depth must be regulated by the character of the soil, climate, and the crop to be grown. A well prepared seed bed is the foundation of success for each and every crop. Of all the implements the plough is and must be the most important tool. The land must be broken up before any other work is performed in the soil. Considerable improvement has been effected in the Western plough during the latter half of the nineteenth century. There are various kinds of ploughs suited to different kinds of soil and work, such as landside plough, Turn Wrest plough, ridging plough, drainage and subsoil plough, double mould board, single mould board, gang, sulky and steam. Much attention has been given in getting a plough which will perform a given amount of work with the least draught upon the animals. There are ploughs which can be made to run to different depths from 2 inches to 24 inches. Improved ploughs upto 12 to 14 inches can be worked by bullock power; but above this depth steam power is necessary.

Indigenous implements exist, but the work turned out by these is inefficient; and to perform the same amount of work more time is required. Our indigenous ploughs simply differ in size from the small Kudavna worked by hand in the hilly tracts to the big, clumsy and cumbersome plough of Sholápur worked by 8 or more pairs of oxen. But taking into consideration labour, time and efficiency the improved ploughs are far superior. For example, take the Ransomes C. T₂ plough. This with 2 good pairs or ordinary 3 pairs of oxen ploughs one acre of land in 2 days, whereas the indigenous plough takes 3 days to turn out the same amount of work in spite of an extra pair of bullocks. Not only this, but the work done is incomplete—it needs cross-ploughing to accomplish similar work as performed by one ploughing of a good Turn Wrest plough. The furrow opened by the indigenous implement being V-shaped leaves unploughed land between the furrow, whereas the Turn Wrest plough makes rectangular furrow and completely turns over the soil.

The improved implements can be divided into three classes according to their usefulness on different types of soil.

For heavy soils ploughs like C T₂, Arlington, and gallows can be used with advantage. For lighter soils of Guzerat ploughs like Monson and B. T₂ and for Konkan still lighter ploughs like Meston, Hindustan and Indian wooden plough would give efficient tilth. Implements like leveller (Road scraper), Planet Junior hand hoes will be of great use everywhere. Implements like improved seed drills, thrashing and winnowing machines, mowers, etc., can be used by those who have large holdings or estates.

The advantages from the Turn Wrest plough suitable for ordinary soils have been sufficiently pointed out above. But for ploughing sugarcane lands and heavy soils very much infested with deep-rooted weeds ploughs of heavier descriptions are needed. In the black cotton soils of the Deccan and Karnátic deep rooted weeds such as Kunda

(*Andropogon intermedius*), Hariali (*Cynodon dactylon*), and Lavala (*Carex indica*) have almost everywhere infested the land to a considerable extent. The direct traction Gallows plough does very good work, but does not go sufficiently deep to remove the weeds at the first attempt. To eradicate the weeds completely, the land to a depth of 18 to 20 inches must be turned over. To do this work efficiently the Balance gear plough manufactured by Messrs. A. Bajac and Co., France, is well suited. The plough is drawn by means of wire cables alternately from one end of the field to the other by means of windlasses set on wheels. Each windlass is worked by two pairs of bullocks. One man is required to set the plough and steer it. It does excellent work by penetrating to a depth of 18 inches, while the width of the furrow is also about the same. It needs three days to plough an acre of land and costs Rs. 35. This plough has been found to be very effective in the extermination of Hariali in the Southern Marátha Country. The one advantage of this plough is that the bullocks are not required to walk in the rough cloddy field. Excellent Kharif crops can be grown in the same year in which the land is ploughed. Another advantage is, that the land is left level without any holes and hollows which are generally left by hand-digging. The usual practice in the Karnatic is to hand-dig such Hariali infested lands, and the cost of hand-digging varies from Rs. 30 to 50 per acre according to the condition and the character of the soil. The depth reached is not more than 12 to 14 inches. The Bajac plough with windlasses, etc., costs Rs. 3,100 and is not within the means of ordinary cultivators. This plough is worked for the present on a hire system in the Karnatic. The work of this plough has been fully appreciated by the cultivators in that tract.

A similar but a two gang plough has been obtained for eradication of deep rooted weeds from the black cotton soils of Guzerát. In Guzerát the land becomes unploughable by the ordinary plough, by the time the crops are harvested, but this plough has been found to be effective even under such conditions.

A steam plough has been recently ordered by the department. The initial cost of such a plough with two steam engines comes to Rs. 40,000, the annual working expenses would amount to about Rs. 10,000 more, thus for one such plough an investment of about Rs. 50,000 is necessary. This is not within the means of ordinary men. But the work is performed more expeditiously and efficiently than the Bajac plough. It can plough about 8 acres of land in a day of 8 hours and costs from Rs. 18 to Rs. 20 per acre. But for ploughs like Bajac and steam cooperation of manufacturers, traders, landlords, and rich men is needed.

There are several other improved implements of the kind which can save labour to a large extent. The Disc harrow is a very useful implement for breaking up stubble after harvesting of the crop, and thus facilitates ploughing afterwards. But the cost is prohibitive and is not within the means of an ordinary ryot. During my recent visit to Baroda farm, I had an occasion to see the working of the Disc harrow only introduced this season. The more salient features were the fine condition of the soil it turned out, and quite as deep as reached by the local plough. But what was surprising was the swiftness of its work finishing roughly 2 to 3 acres in a day.

In the indigenous seed drill the dropping of seed is solely in the hands of the sower, but in an improved seed drill the box is filled with seed and all the work of distribution is done automatically with great precision and exactness, which the most expert sower will never be able to achieve. Dropping of seed in the row, as well as, the distance between rows can be mechanically adjusted as required.

The work of the Planet Junior Co.'s hand hoes has gone a long way in reducing the cost of hand weeding. This is specially useful for small holders of land who do not possess bullocks and also under conditions, where bullock hoeing becomes impossible owing to height of crops. For want of bullocks the land remains unhoed and unweeded. This implement eradicates annual weeds from the space between rows and at the same time makes the soil loose and friable. One man with a hoe can work $\frac{1}{2}$ to 1 acre per day—whereas to hand weed about an acre 15 to 20 women are needed. So the use of this small implement costing about Rs. 15 saves a good deal of time and labour.

During the fair weather, when threshing is generally performed by cultivators, there is a great demand on bullocks for ploughing the land. Very often tillage suffers at this time for want of bullocks. All the available bullocks are required for threshing under the present system of treading out the grain. Usually 4 to 6 pairs, and even more, are required according to the quantity of the crops to be threshed. To perform this operation economically, efficiently, and expeditiously there are indigenous, as well as, foreign implements. The Olpád thresher or the Egyptian Norag, each costing about Rs. 40, perform the threshing work at a much cheaper cost, and within less time than the ordinary method of treading the crop under the feet of the bullocks. The thresher is worked, by one pair of bullocks. By this process it costs Rs. 3 to thresh 1,000 lbs. of grain, whereas with bullock treading the charges come to about Rs. 9.

Another instance may be quoted of threshing jowar by stone roller. This practice is in vogue in the Bellary district of the Madras Presidency and partly in one or two talukas

of the Dhárwár district. On the Bhadgaon Farm stone roller was used for threshing jowar crop. It performs an excellent work and at a very small cost. To work the roller 4 ordinary bullocks or 2 strong he-buffaloes are required. In a day of 8 hours, the jowar ears from 7 to 10 acres can be very easily threshed.

The glumes of khapli wheat are very persistent and are not easily separated by ordinary threshing. They require pounding to remove the glumes at a great cost. But this work can easily be performed by putting the khapli wheat in the ordinary chunam mill. To thresh one khandi of khapli wheat by this method the charges come to Rs. 1-12-0, while the pounding process costs Rs. 3-12-0.

After threshing grain the troubles of the cultivator are not over; but he is required to wait for wind for winnowing and cleaning his grain. Sometimes when the wind fails he is required to wait for days and days together. If cleaning of grain is performed expeditiously, then his valuable time can be utilized more usefully elsewhere. This work can be performed by a winnower costing about Rs. 125. There are also large winnowers which are worked by steam power. But they are suitable only in such tracts like the Tapti Valley where a considerable area is annually put under wheat. The ordinary winnower worked by hand power cleans about 1,000 lbs. of bajri at a cost of 3 annas.

There are numerous kinds of levellers found in different tracts of this Presidency. But the work performed by any of these does not compare favourably with that accomplished by similar implements of the Western pattern. The levellers of American manufacture costing from Rs. 18 perform the levelling work much more easily, and, at a much less cost. This implement is specially useful for filling up inequalities and hollows in fields and making new, and repairing old embankments. But if I go on to describe each and every one in the same detail as I have done so far, I fear I shall be encroaching upon your time. All these have been described in detail in "Shetki and Shetkari" magazine on various occasions and I have also written a book in Maráthi in which all details can be found. The Department also has issued recently a leaflet, recommending some tried and useful implements.

There are several other implements and machines of Indian manufacture, which can be used economically, such as the iron sugarcane mill in place of a wooden mill, iron mhot, Cawnpore pump, etc. The iron mill extracts 66 per cent. of the juice or 15 per cent. more than the wooden mill. It will not be out of place here, if I quote some of the figures, as to trials of different mills made at the Manjri Farm where 500 lbs. of sugarcane was crushed by each mill:—

	Percentage of extraction.	Time : hours, minutes.	Average draught in cwt.
Poona mill	66	1-10	2½ — 3
Behar mill	61·1	1-45	1½ — 1½
Nahan mill	66·8	1-22	2¼ — 2½
Pearl mill	66	0-53	2 — 0
Power mill	70·0	0-80	20 B. H. P.

CARE OF IMPLEMENTS.

When improved implements are bought, they need careful and skilful handling. Mere ownership does not bring on success in farming. There is success in the intelligent use of these. There are instances, where implements were bought and then thrown aside as worthless, simply on account of ignorance about working them. All tools and implements must be put under a shed to protect them from sunshine and rain. Specially the wooden parts very soon begin to decay or split or crack, and iron and steel parts become rusty. The improved tools need one painting a year and it will pay to do this.

Before starting work with an improved implement it must be inspected very carefully to see, whether all the nuts and bolts are tight, and all other parts in their proper places. If the man who uses them is careless, some parts of the implement will give way and thus interfere with the work. The implements must be oiled occasionally. Oiling reduces friction. When any implement is brought from the field it must be cleaned of any dirt and then kept under shelter. The proverb "a stitch in time saves nine" is applicable in the case of implements also.

But there are numerous difficulties in the way of introduction of these improved implements:—

(1) The high prices of the improved machinery.—Most of the cultivators having small parcels of land, with scattered holdings, have not the capital usually required for better cultivation and improvement of land. Many do not even possess bullocks; they have to be hired out from time to time when required.

(2) The implements cannot be easily repaired in villages, and the wanting or broken parts cannot be easily replaced. In a village even for a small nut and bolt they must go to the city. But storage of spare parts has removed this difficulty to a certain extent.

(3) It must be admitted by all, that the cultivators have not any notion of the value of time or labour.

(4) They are suspicious about new things. On account of illiteracy and ignorance, they are never willing to change their established methods. Even the educated cultivators show apathy towards anything new. But when once they are convinced they are never slow to put it into practice.

Under these circumstances, the most difficult and perplexing problem at the present day is, how to carry a knowledge of these new implements from the experimental farms to the very door of the cultivators. Since the re-organization of the Agricultural Department in this Presidency a large amount of work, useful to the cultivators has been achieved at the agricultural stations. The Agricultural Department has arranged with the manufacturers and their agents to stock improved implements at agricultural stations for sale to the cultivators at cost price. Attempts are being made to bring this knowledge to the notice of the cultivators through the District staff, and by holding shows, exhibitions and demonstrating the utility of improved implements, by actually working them on the land in the presence of visitors. But such work as the Agricultural Department can alone do, is only an insignificant trifle of the whole country to be reached.

The second way is by publications—such as, monthly magazines, leaflets, etc. The matter contained in these publications is important no doubt, but, in the present state of the farmer's education, he cannot much appreciate it, since very few of them can read and write. Under the circumstances, to bring this useful knowledge to the notice of the cultivators, these publications must be read to them. This work can best be done by our educated classes residing in the villages.

New agricultural associations and co-operative societies are springing up into existence in increasing numbers day by day. These bodies will form an excellent medium for communication of agricultural information. If the members of these societies, and leaders of the people take this work of disseminating agricultural knowledge into their hands seriously, and systematically, it will not be very distant, when the up-to-date improvements will gradually filter down among the cultivating classes. Hundreds of such societies for the employment of agricultural machinery are doing excellent work in France and Belgium. Our societies should also undertake the agency for the supply of seeds, manures, and implements with spare parts. Implements of proved utility can be hired out to needy cultivators. Specially this will be of immense benefit to the cultivators, having comparatively small lots of land and insufficient means to purchase them. Some associations are taking up this work. The Saswad Society has bought a plough and scraper, and they are hiring the implements to needy cultivators at a nominal rent. The Broach Association is doing excellent work in this connection, and they have located such implements at each taluka catchery for free use of needy cultivators.

At the request of Sardar Coopuswamy Moodaliar, five sets of improved agricultural implements have been bought by the Agricultural Department, and have been located at Vadála, Málegaon, Hadapsar, Islámpur, Bársi, etc., in the Deccan. These implements are hired out to the cultivators. They will be kept for one year at each centre and then transferred to the next.

It is impossible for Government to extend this system all over the country. The initiative ought to come now from the educated and rich leaders, for purchasing and hiring out such improved implements to those who cannot afford to buy them on account of high prices, etc.

But, in order to do away with all the difficulties mentioned above, several factories for manufacture and repair of implements must be established in this country. Such factories can come into existence only, where a good demand for these implements exist. Amongst the manufacturers of local implements Messrs. Kirloskar Brothers are the only pioneers in the Bombay Presidency. They have their factory near the Kundal Road Station in the Sátára district. They established their factory in 1905 after studying the local requirements. First they were manufacturing only chaff cutters. Later from 1906 they began their work on ploughs. They manufactured small, as well as, large turn wrest ploughs of the type turned out by Messrs. Ransomes Sims and Jefferies. They are selling these ploughs in numbers and, day by day, they are making improvement as regards their lasting qualities and efficiency in work. Encouraged by these results they have now undertaken successfully the manufacture of several small things useful for agriculturists, such as, maize shellers, chaff cutters, cart wheels of improved type, iron mhots, frictionless pulley, hand hoes, etc.

But unless Sardárs, Jahagirdárs, landlords, and rich men having means, take up this business of agricultural industry in their hands little can be done in the way of improvement. H. E. Lord Willingdon, our present Governor, is paying a good deal of attention towards

farming. He has already begun cultivation of lands situated within the Government House compound. He is going to grow fodder crops, and start a small model dairy where particular attention will be given to the pedigree of milch cattle and the breeding bull. It is the intention of His Excellency to distribute breeding bulls of known pedigree from his herd for the improvement of country cattle.

It is now time to wake up the agricultural industry which upto this time has been locked down on : it must be put at the top, and the rich men should come forward to follow the object lesson, laid before them by His Excellency and to help to make the country prosperous. It is stated that, Sir Robert Walpole, the great Prime Minister, always used to examine his farm reports before he opened his despatches. King George III was known as the Farmer King, and the model farms, which he established, have continued down to the present day in England.

In addition to this to make knowledge widespread there is need of workers, who carry in their hearts the love of faith, and who have the spirit of sacrifice, of men who have the missionary spirit and the service of the country, and community at heart.

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SCOPE FOR THE EXTENSION OF BROACH COTTON IN THE SOUTHERN DIVISION.

The history of Broach cotton in the Southern Division of the Bombay Presidency dates from the year 1904. The original idea of introduction of this cotton started from a local cotton merchant of Hubli, the late Mr. Rachappa Anna Nili. Mr. Nili, having failed in his attempt to introduce Broach cotton successfully through want of knowledge of the proper time for sowing this variety and other conditions required, had left the idea of Broach cotton altogether. In the meantime the writer of this paper happened to be transferred to Dhárwár as Superintendent on the Government Farm and having had experience of its cultivation in Guzarat, picked up Mr. Nili's old idea of introduction of Broach cotton in the Southern Division and commenced experiments on the Dhárwár Farm on a small scale. The experiments proved successful on the Dhárwár Farm and its cultivation has since gradually been taken up by cultivators throughout the Division.

You might imagine how great satisfaction the writer as well as the Department might be feeling to see that the crop, sown experimentally on the Dhárwár Farm in the year 1904, on a small plot of 5 gunthas, was grown by cultivators last year on more than 5,000 acres in a few villages in the Dharwar and Belgaum districts, with an extra profit of Rs. 27,000 on 2,830 acres to the growers. The introduction of Broach cotton has thus passed the stage of experimental trial by the Agricultural Department in suitable tracts, but has reached the commercial stage requiring help and co-operation of those who are interested in the improvement of cotton.

Improvement in cotton concerns two bodies, *vis.*—

- (1) The growers.
- (2) The consumers.

The growers in certain tracts of the Southern Maratha Country are thoroughly satisfied from experience of the last 6 or 7 years that the new cotton is suitable to their tracts and gives them more profit. The following statement gives a clear idea of how the cultivation of Broach cotton is increasing in the Southern Division and what has been the extra profit to cultivators during the last four years by growing it:—

Serial No.	Years.	Broach cotton sold in Nagas.	Probable area to grow the cotton, in acres.	Rate on the date of auction sale for			Actual total amount realized by the sale of Broach cotton.	Amounts for the same quantity of cotton at rates for the local variety.	Amount of extra profits to cultivators.
				Highest grade of Broach.	Lowest grade of Broach.	Local Kumpta.			
				Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1	1910	654	2,616	190	163	145	1,11,455	94,830	16,625
2	1911	171	684	220	191	153	37,089	26,163	10,906
3	1912	430	1,720	203	173	146	81,545	75,680	5,865
4	1913	595	2,880	200	161	138	1,09,393	82,110	27,283
			7,400			Total ...	3,39,462	2,78,783	60,679

The total value of cotton sold through the Agricultural Department during the four years, from 1910 to 1913, amounts to Rs. 3,39,462 and the extra profit realised by cultivators is Rs. 60,679. This amount of extra profit, *vis.*, Rs. 60,679 to the growers of Broach cotton during four years might look at first sight, to the readers of this paper, to be insignificant. But the profit mentioned is not on the whole suitable area for Broach cotton in the Southern Division. It is on an inconceivably small area of 7,400 acres in four years or Rs. 15,000 on 1,850 acres or Rs. 8 per acre per year. The approximate area suitable for Broach cotton in the Dharwar and Belgaum districts alone is roughly 100,000 acres excluding a large area from the adjoining Mysore State. Supposing even half the suitable area above mentioned is grown with Broach cotton the extra profit to cultivators would be Rs. 4,00,000 every year. Besides it would supply to the mills 15,000 bales of excellent cotton which is classed by experts in Bombay as equally good as best Navsari cotton. In making the above calculations, I have taken the yield per acre of Kapas of both the Broach and the local Kumpta to be about the same, *vis.* : 350 lbs. per acre. But from experience it has been found that Broach, under similar cultivation, yields more than the Kumpta.

Certain cultivators say that Broach cotton takes more nourishment from the ground and consequently the yield of the following Juar crop is poor. The question is taken up by the Department and experiments are being tried to see whether such is really the case. No such results have hitherto occurred on the Dhárwár Farm where Broach cotton is grown since the farm is started. Investigations are also being made to find out a suitable green manure crop to be grown simultaneously with cotton and bury it in, while weeding or interculturing.

The figures of profit to cultivators and the number of bales of clean cotton expected above in the Southern Division are not merely imaginary. They are based on actual figures of the last four years and can certainly be realised if proper efforts are made by bodies concerned with the improvements of cotton. The Agricultural Department has done its duty in finding out a suitable superior variety for certain tracts in the Southern Division and has convinced the cultivators that there is more profit in substituting this variety for the local ones under suitable conditions. The cultivators are also satisfied with regard to the yield etc. of Broach cotton and are acquainted with the proper method of its cultivation. Now the work lies with the consumers. It is for want of their co-operation and help that the rapid extension of Broach cotton in the Southern Division is lagging behind and the object of this paper is to bring this fact to their notice and ask their help and co-operation in the work already done by the Agricultural Department in introducing Broach cotton and extending its cultivation on as large a scale as possible.

There are at present certain difficulties in selling the Broach cotton grown by cultivators. The present arrangement is that the Agricultural Department collects all the Broach cotton grown by cultivators, grades it according to percentage of lint and sells the same on a fixed date by public auction, which is attended by local Dalals and representatives of some mill-owners. The sale of all the cotton on one fixed date is liable to the risks of fluctuating markets, which sometimes results in very low prices. The second difficulty is that the local Dalals do not advance money on standing crops of Broach cotton so freely as they do in the case of Kumpta or saw-gin crops. The third difficulty is that the time of collection of Government assessment falls before the Broach cotton is sold by auction through the Agricultural Department, and to pay the assessment in time, cultivators are required to borrow money from Savkars at exorbitant rates of interest. The fourth drawback by the present arrangement for the sale of Broach cotton on one fixed date is, that all the pickings are not ready before the date of sale especially in years of late season for cotton. Thus a quantity of cotton remains unsold and very low prices are offered by local Dalals for the cotton brought for sale after the auction sale is over through the Department. To avoid all these inconveniences cultivators do not like to sow Broach cotton on a large scale though they perfectly know that its cultivation is more paying than the local cotton.

The difficulties mentioned above can be remedied by starting buying agencies by consumers of this cotton at two or three suitable centres for the cotton grown from reliable seed that is supplied by the Agricultural Department. The prices offered by these agencies for such cotton should be higher in proportion to its higher percentage and quality of lint, as compared with the local Kumpta cotton. The agencies, on the recommendation of the officers of the Agricultural Department, might advance small amounts of money to needy cultivators free of interest for short periods, especially when the season is late so that the growers will not have to go to Savkars to borrow money for payment of assessment in time. A large supply of pure sound seed partly from Navsari and partly from the best crops grown locally from the first generation of seed should be made available to cultivators every year at moderate rates. This is at present done by the Agricultural Department at some net cost, which will be too much to Government if the area under Broach cotton extends on a large scale. With these remedies the writer fully believes that the cultivation of Broach cotton will rapidly increase in the Southern Division, which will fetch a large amount of extra profit to the cultivators and will supply a good quantity of superior cotton to the mills.

The cotton, that is sold at present through the Agricultural Department by public auction, does not all reach the mills in pure condition except what is bought direct by the representatives of mill-owners. The middlemen invariably mix the local cotton in it and sell the mixture under the name "Dharwar Broach" which must naturally be inferior to pure Navsari. This may perhaps be the reason why "Dharwar Broach cotton" has not yet attracted the attention of the Bombay Cotton Trade.

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Divisional Inspector of Agriculture, S. D.

FUNGOID DISEASES OF PLANTS AND THE WORK DONE IN THE
BOMBAY PRESIDENCY IN CONNECTION WITH THEM.

It is a matter of common knowledge, at least with the cultivating classes, that the crops that we grow are subject to a large number of diseases. Unfortunately, a knowledge of the causes of these diseases is not nearly so common and a knowledge of the remedies still less common. For although plants have been cultivated by man for ages past, it is only in comparatively recent times, that they began to be studied as living organisms and it is little wonder, when we know as yet so little about plants in health, that we know still less about their diseases. Moreover, the causes of plant diseases are often so obscure, epidemics appear so suddenly and mysteriously and spread so rapidly, that there has been and still is much superstition among the people on this subject. The causes of some diseases, such as those due to insects or to unsuitable conditions of weather, temperature etc., are indeed not difficult to see, though even here the suddenness of the attack and the rapid spread often appears mysterious. But there is still a large class of diseases, which has been known from the earliest times, but about the nature of which there has been wild speculation even among scientists and which have been, nay, still are attributed to the anger of the gods by the superstitious farmers, not only in India, but in other countries. The progress of science in recent times and the diffusion of scientific ideas among the masses have gone a great way in overcoming such superstition. The attitude of mind now is not to wonder at a mystery, but to try and solve it. As a result of this attitude, the mystery, associated with one whole class of important plant diseases, has been solved and it has been possible to ascertain the cause and suggest remedies or preventive measures in the case of a considerable number of them. The class I allude to is that of the diseases due to Fungi, and I propose, in this paper, to give a popular account of these minute organisms and the work done by the Bombay Department of Agriculture against some of the diseases caused by them and trust that it will not be without interest to the members of this Conference.

To begin with, it would be best to explain what is meant by the term Fungi. Fungi are very minute plants, often so minute as to be visible only with the aid of the microscope and the most familiar examples are Moulds (बुरशी), Mushrooms (कुंयाचा छत्रो), Toad-stools (सळिंब), Rusts (तांबेण), Smuts (काजळी, काणी). They have certain peculiarities, which easily distinguish them from the plants we ordinarily recognise as such. They have, in the first place, a very simple structure. One does not find, in the body of the fungus, that differentiation into organs like root, stem and leaves, which one is accustomed to see in ordinary plants. There is, indeed, a distinction between a vegetative and a reproductive part, but a fungus plant does not produce any flowers. The vegetative part of a fungus consists usually of an extremely minute tube with thin walls, which may or may not be divided into compartments by partitions, and which may and usually does branch profusely, producing to the naked eye, the appearance of a web of delicate threads, commonly of a whitish colour. These minute tubes or threads perform all the functions of absorption of food materials and nutrition of the plant body, performed by the ordinary plants by root, stem and leaves. The vegetative part usually lies buried in the substratum, on which the fungus grows.

The reproductive part consists essentially of little bodies known as spores (seeds of Fungi), which are produced on branches of the tubes or threads which constitute the body of the fungus, or occasionally in special spore-bearing structures, which assume quite a variety of size and shape. These spore-bearing parts of a fungus usually stand out from the substratum and are often the only part of the fungus visible. The umbrella-shaped or bracket-shaped structures of mushrooms and other fungi are examples of the most elaborate spore-bearing structures among Fungi. If a mushroom be pulled out, one generally finds some minute white threads attached to the base of the stalk. These are not, as might be supposed, roots of the mushroom, but they are a part of the body of the fungus, of which the mushroom represents the spore-bearing part. The immense variety of shape and size in the spore-bearing parts serves as a basis for classification of fungi and enables one to distinguish one fungus from another, just as differences in shape, colour and structure of flowers serve to distinguish higher plants from one another.

Simplicity of structure is not, however, the only distinction between a fungus and an ordinary plant we know as such. The most important distinction between the two is the entire absence in the fungus of the characteristic green colouring matter, which is inseparably associated with plants, particularly with their leaves, in our ordinary conception of them. We shall be able to grasp the significance of this absence of green colouring matter—*chlorophyll* as it is technically called—only when we inquire what *chlorophyll* does in the economy of plant life. It is by its means that plants are able to utilise the energy of the sun's rays to decompose the carbonic acid gas in the air, retaining carbon for their use and giving up free oxygen. The carbon so isolated and absorbed by the leaves is worked up into various complex substances like starch and sugar, and utilised by the plant to build up its body. It is extremely difficult to believe, yet it is none the less a fact, that huge plant bodies, like those of Banyan trees for example, are built up mainly from the carbon derived by the leaves from the air with the aid of the green

colouring matter contained in them. The soil only supplies the water and some salts which are necessary to work up the carbon into assimilable articles of diet, so to speak, but the main addition to weight is due to the absorbed carbon. The importance of *chlorophyll* to plant life, nay, to all life, plant or animal, will be judged only when we reflect that, were it not for its power to utilise the energy of the sun's rays to decompose carbonic acid gas, it would not have been possible for any organism to make use of simple substances like metallic salts and carbonic acid gas and to prepare such food from them as is necessary for maintaining life. A man, for example, builds up his body by utilising such chemically complex substances as sugar, starch, proteids, etc. If he had at his disposal only such simple substances as carbon, hydrogen, and oxygen, he would not have been able to manufacture sugar out of them, though sugar contains nothing more than carbon, hydrogen and oxygen, and he would have had to starve, if it had not been possible for him to derive his food already elaborately prepared in the bodies of plants or in those of other animals which themselves have derived their food from plants. In other words, all life is directly or indirectly dependent on *chlorophyll*, the green colouring matter in plants. Those organisms that possess it are self-sufficient with respect to their food supply. They are, as it were, their own manufacturers. Those organisms that do not possess *chlorophyll*, have to depend for their food on those that do possess it, that is to say, the former are consumers of what the latter produce. All animals are consumers merely, without being producers, from this point of view. Plants, with some exception, are producers and the Fungi are such exceptions. Owing to the absence of *chlorophyll* they have to depend upon plants or animals for their food supply. They must live at the expense of others, must live as parasites, this last term being used in the popular sense of the term. For the purpose of science it is convenient to distinguish fungi further into *saprophytes* and *parasites*. The *saprophytes* derive their food from dead organisms and the *parasites* from living organisms. There are some Fungi, which can be saprophytes or parasites, can live on dead or living organisms, according to circumstances; but this distinction is nevertheless useful.

Some saprophytic Fungi, like moulds and some kind of mushrooms and bracket Fungi, which destroy wood, cause much economic loss, but, on the whole, the saprophytic Fungi are comparatively unimportant from the point of view of plant diseases, living as they do, at the expense of dead organisms. They are most important, however, from another point of view. In company with Bacteria, another important group of chlorophyll-less plants, the saprophytic Fungi are most serviceable in bringing about the decomposition of dead plants and animals and clearing the ground for fresh life. But for their action, the earth would long ago have been rendered unfit for further life by the accumulation of remains of dead organisms. The saprophytic Fungi and Bacteria are, in short, scavengers of Nature and as such their importance cannot be exaggerated.

We are more interested, for the purpose of this paper, in the parasitic Fungi, which live at the expense of living plants and produce various diseases in them. Without the microscope it is not easy to explain to the layman how these minute organisms, living in the tissues of plants, could cause serious diseases. If one reflects, however, on the few more evident instances of parasitism among higher plants, it will not be difficult for one to form an idea of what these Fungi do. The Bandgul (*Loranthus* sp.) is the best known of parasitic plants in these parts. The seed of this germinates on a branch of a mango tree (to take only one of the many kinds of trees on which the Bandgul is capable of growing) and sends its roots or suckers inside the branch, there to rob it of the food materials prepared by the mango plant for its own use. When this happens on a large scale, it is easy to see that a considerable injury may be done to the mango plant. Other instances of parasitism among the higher plants are *Orobancha* sp. (बंजासू) on the roots of tobacco, *Cuscuta* sp. (Dodder—अमरवेल, निमोळी), parasitic on lucerne and other plant *Striga* sp. (शरकुला) on roots of jowar and sugarcane. Although fungi are much smaller than these plants, they are even more efficient as parasites and they make up for their size by the immense numbers in which they occur and the rapidity with which they propagate themselves.

Some estimates have been made of the amount of damage due to fungoid diseases in various countries. Thus:—

	Rs.
Annual loss from wheat rust in India	40,000,000
" " " " Australia	30,000,000
" " smnt of oats in America	50,000,000

These figures are startling and bring forcibly to our minds the importance of the study of these parasitic organisms.

Before proceeding to describe the work done by the Bombay Department of Agriculture in connection with plant diseases, it is well to mention that it is not much more than 50 years since the study of plant diseases was begun even in Western countries.

The workers in this branch of science are few, the difficulties in the work are great and the accumulated experience of the human race in this matter is very little, especially if we compare the science of plant diseases with that of human diseases. It would not be fair, therefore, at this stage, to expect anything like a complete knowledge of plant diseases and their treatment. Nevertheless the knowledge obtained even in such a short time has proved immensely useful to the farmer, and where no curative treatment was possible, it has been found, in many cases, that suitable preventive measures could be recommended and much loss prevented. As a matter of fact, in the case of fungoid diseases, the principle "Prevention is better than cure" is even more applicable than in the case of human diseases. A fungoid disease is noticed most often only after it has done all its harm and very often no curative treatment is possible. It is on this account that it is very necessary to spread the knowledge of this cause of plant diseases among the cultivators. They will only then realise the importance, in combating plant diseases, of keeping fields and gardens in sanitary conditions, of removing and destroying diseased crops, of using healthy well selected seed, of plant hygiene, in short, a subject which has received little attention in the past. They will also then realise the necessity of co-operation, of concerted action of all the cultivators in keeping out diseases from a particular locality. Farmers in foreign countries have even begun to call for the power of the law in keeping out plant diseases, and the Indian farmer cannot afford to be behind the times in this as in other matters.

It is not possible in this paper to give a complete list of fungoid diseases in crops, with their symptoms, causes and remedial measures. Many of them have yet to be studied in detail before any recommendations can be made about them. Here it will be best to confine myself to describing a few of the commonest diseases in the Bombay Presidency and the efforts of the Department of Agriculture in popularising the methods of dealing with them among the people.

1. *Smut in Jowar*.—This is one of the commonest of fungoid diseases and does enormous damage in this Presidency. It is known by the terms *Kajli* or *Kani* in Marathi and *Kadige Roga* in Kánarese. The chief symptom is that the mealy contents of the grain are replaced by a black, sooty powder. This powder really consists of millions of spores (seeds) of the causal fungus. These spores are blown by the wind in large numbers and they settle on the grains in healthy heads. They remain so attached until next sowing time, when they are naturally sown along with the grains. On germinating they infect the seedling and the resulting fungus continues growing inside the plant, until the head is formed. The fungus becomes visible only when it forms its spores inside the grains.

A solution of copper sulphate (मोरचूत) is known to act as a poison to these smut spores, and the remedy against this disease is therefore to steep jowar seed in a solution of copper sulphate (1 to 2 per cent.) for 10 minutes before sowing.

The Department has issued a leaflet on this subject (No. 20 of 1909), in which are given full instructions regarding this treatment. In addition to this, this steeping method has been demonstrated at every agricultural show for several years, and also in some cases on the fields of the cultivators themselves. An arrangement is also at present under consideration, by which copper sulphate could be provided in small packets with instructions for use to the cultivators in order to remove all difficulties in the way of universal adoption of this preventive remedy. This disease occurs universally in the Bombay Presidency, and considering the total acreage of jowar (6,090,000 acres) the loss must be enormous (Rs. 17,500,000 in round figures, taking it at 5 per cent. per acre, which certainly is an under-estimate. The remedy costs only Rs. 0.0-6 per acre and is extremely simple to carry out, and there is no reason why it should not be universally adopted.

2. *Grape Vine Mildew*.—This is a disease known as *30* in Marathi and *31* in Kánarese. It causes enormous damage in grape-growing localities. Its symptoms are: the leaves and berries become covered with a fine flour-like powder, which on closer examination will be found to consist of threads and spores of a fungus. The affected leaves become shrivelled and dry up. The berries remain undeveloped and are unfit for the market. There is a simple remedy against this disease. The Department of Agriculture have carried out a series of experiments at *32* during the last three years, and have convinced the cultivators there of the necessity of this remedy. The results of these experiments are published in *33* and *34* of the Bombay Department of Agriculture and a leaflet (No. 21 of 1909) has been issued, giving instructions. The remedy is to give a preventive spray of copper sulphate (copper sulphate and lime) and soap. The cost of this spray is Rs. 5 per acre, and the loss from disease varies from *35* to *36* per acre. At Násik it was found last year that spraying with this remedy resulted in a 50 per cent. increase in yield and outturn, compared with unsprayed vines. It is therefore evident that, in addition to the former from the latter. If this remedy were universally adopted, the disease could be practically eradicated. It is therefore of the importance of concerted action.

3. *Red Rot in Sugarcane*.—This occurs in various parts of the Presidency and the outward symptoms are a gradual drying up of the canes, as if from drought, though plenty of water may be present. Affected canes when split show a characteristic reddening of the pith, which gives the name Red Rot. The yield suffers both in quality and quantity. The commonest way in which this disease is conveyed to a fresh crop is through diseased sets. Infection also may occur from the remains of a previous diseased crop, and hence the necessity of destroying all such remains and also adopting careful rotation. The disease occurs more frequently in ill-drained soils and crops grown from Ratoons and in Adsali crop, which remains longer than a year in the field. Careful selection of healthy sets, if carried on systematically every year will keep out the disease. "Red Rot" has been doing considerable damage in recent years in the Surat district. There the practice of planting whole canes instead of cut sets is to be discouraged, because it prevents the disease being detected in the seed. Introduction of healthy seed from Mánjri has been tried by the Department during the last two years on some cultivator's land, and the practice of planting cut "sets" instead of whole canes is being advocated with very good results. A leaflet (No. 1 of 1910) has been issued on this subject and also a bulletin (No. 40 of 1912).

4. *Koleroga Disease of Supari Palms*.—This serious disease of betelnuts prevails in the North Kánara District, where this crop is the most important of garden crops (total acreage under betelnuts for the whole district is in round numbers 18,000). The loss per acre is estimated at from 10 per cent. to as much as 75 per cent. and in the worst cases at even 100 per cent. Taking into consideration the total acreage, it is easy to see that the loss is very serious, amounting to Rs. 900,000 per year at least, taking the low estimate of 25 per cent. as the average loss all round per year.

The disease is not due to excessive rain, as is universally believed by the people, but it is due to a fungus which thrives during the rains. Hence the local preventive measure of "Kottetying" (*i. e.* covering the bunches with hoods made out of basal leaf-sheaths of betel palms), which is intended to keep off rain from the bunches, does not touch the real cause of the disease, although it acts fairly efficiently, if done carefully and in good time. But this is not always practicable, and in some parts it is very costly. For this reason some preventive measure must be used which will attack the cause of the disease more directly. Since the last year the Department has been making efforts to introduce the practice of spraying the bunches with Bordeaux mixture with resin as an adhesive which has been tried with considerable success by the Mysore Agricultural Department and has already begun to be appreciated by the cultivators in those parts. Some of these have substituted spraying for Kottetying on their own account. It is to be hoped that the garden owners of North Kánara will follow the example of their brethren in Mysore and secure themselves against the enormous losses caused by this disease.

There are many other diseases of crops besides the four above described in the Bombay Presidency. The "Wilt" diseases of Tur and Cotton are also due to Fungi and cause much loss. The "Wilt" on cotton, it is to be feared, is on the increase year after year. The potato crop is subject to various fungoid diseases, and the Rust on wheat and Smut on bajri are very well known diseases. Many of these have yet to be fully studied, and in the case of some of them, *e. g.*, wheat rust, the only method of dealing with them consists in breeding artificially disease-proof varieties by careful experiments. The science of plant breeding has been making rapid progress in the West and the results achieved even in this short time are very encouraging. Immunity and susceptibility to disease seem to be inheritable according to certain rules and this should give us ground to hope that in the case of such plant diseases as cannot be directly dealt with by preventive or curative remedies, the introduction of disease-resistant strains will relieve the distress. Much work has yet to be done in this direction; the work can hardly be described as having begun in this part of the world, but it is very necessary all the same to interest the cultivators in the kind of work that is being done by scientific men in this and in other countries and the benefits that agriculture has derived from the sciences. It is only when such interest is awakened, that we shall be in a position to combat that great enemy of progress—Superstition—and cultivators will co-operate with scientists instead of, as before, acting as a drag on them or even putting obstacles in their way.

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HORTICULTURAL POSSIBILITIES OF WESTERN INDIA.

The subject matter of this paper, so far as I am aware, has not been seriously discussed amongst the public of this Presidency, nor even by that section of it who take considerable interest in the advancement of agriculture. The general public perhaps realises very little of the importance of *Horticulture*.

In the course of the last 9 or 10 years, the Bombay Agricultural Department has been actively engaged in doing something to improve agriculture, pure and simple. Implements of superior efficiency have been introduced into the country. Improvements in field practices are being constantly pressed to the agriculturist's notice. Economy in the manufacture of agricultural products, transporting improved methods of agriculture and superior kinds of seeds, etc., from one district to another are also effected with splendid success. The people at large are benefited by these and they actively co-operate with Government in their efforts to improve agriculture.

But little attention has so far been paid to *Horticulture* by the public at large. Its enormous possibilities have not received the thought they deserve.

The Horticultural branch of the Agricultural Department has been silently working along most of the lines demanded of it. New varieties of fruits, such as Strawberry, Guava, Ceylon Papaya, Naval Orange, Cattleya Guava, Muskat pomegranates, etc., are being tried and useful ones are distributed whenever it is possible to do so (for instance, the Ceylon papaya distributed to the public). Experiments aiming at improvements of indigenous fruits are in progress. A lot of information about local peculiarities of culture and about the needs and problems confronting cultivators is being collected. Trials of exotic plants on a moderate scale are proceeding and whenever any useful ones are acclimatised they will be brought to the notice of the public. In a similar manner several other subjects are being investigated. The quantity and quality of the output of work and results are commensurate with the strength of the scientific staff engaged, but it is to be much regretted that very few of the public are inclined to see in what way they can take an active share in the furtherance of this branch of science, and how they can extend Horticultural interests of the country. It is my intention, to-day, to call attention to this state of apathy and to attempt to stimulate public interest by bringing to the notice of this Conference Horticultural possibilities of the Presidency.

The climatic conditions of India are admirably suited to the growth of fruits and flowers and yet it is remarkable that very few improvements in the quality of fruit and flower have been made by the people of the country themselves. The staple fruit of the country, the mango for instance, owes its improvements to the Portuguese as the names of the most important varieties indicate. This apathy towards horticulture is all the more remarkable since our ancestors undoubtedly took a great interest in flowers and ornamental gardens as evidenced by innumerable allusions to beautiful ideas about them in Sanskrit literature. The great æsthetic sense which this implied seems to have disappeared in later generations. Our horticultural ideas at present are confined within very narrow limits. They consist in raising a few fragrant varieties of Jasmines, Parijata (Nyctanthes arbor-tristes), one variety of rose, the neglectfully cultivated but sacred Tulsi plant and a few others. Among vegetables a certain number of cucurbits and a few others are raised in kitchen gardens and in their culture little desire to improve varieties is seen. The laying-out of even very small ornamental gardens for their æsthetic effect never occurs to most of our people. It is true that field cultivation of fruits and vegetables and occasionally flowers for profit is done in certain places for purely local markets. But it will be easily seen that there is much room for improvement in this direction.

England, France, Germany, and other countries are much indebted to horticultural science for numerous profitable introductions into the agriculture of the country, of improved forms of fruits, vegetables and flowers. Such forms have been evolved by a close application of principles of plant physiology and evolution by horticulturists. A great share of these achievements belongs to private effort and to *nursery men*. On this side of India at least no such private effort is made. It would not be practicable for Government alone to accomplish all in the line. In the absence of any independent efforts of the people either by individuals or by corporate bodies, I believe, that there is little chance of a general advance in the culture of vegetables, fruits and flowers. It is my intention to suggest here a few lines along which work could be immediately begun.

1. The first line of work that I would call attention to is trial of exotic varieties of crops allied to indigenous ones and also of economic plants, to be undertaken by such of us as have the means and education to understand the value of such undertakings. From horticultural literature, of which there is such an abundance in the West, it seems certain that there exist many kinds of new crops or new varieties of old ones which are useful in industries and which are being exploited in other countries. These need to be tried in this country. To instance a few. *Allium Cepa bulbifera* is an onion which bears little bulbils on the flower stalk. The bulbils can be collected and replanted when our ordinary onion bulbs are produced. If on large trials it is found to economise the trouble and expense of

raising seedlings, this would be another addition to our crop varieties; and in future, in some favoured localities, this may become a predominant variety. Other possible introductions are the *Bambara Groundnut* (*The African Chanx*), the vineless sweet potato, *Mangifera verticillata* (another kind of mango), etc. Instances of this kind may be multiplied almost indefinitely. I realise fully that success in this line needs considerable patience and perseverance and horticultural skill, but this idea need not deter anybody from the undertaking. For, I submit, that there are some plants which acclimatise easily here, *e. g.*, Cactus), with an amount of attention which any ordinary good agriculturist can pay. Nature has not given the keys of her treasures exclusively to the professional horticulturist. Amateurs are sometimes more proficient than professionals and valuable introductions may happen to be made by them. I may suggest here one problem for people from the Konkan. It is well known that large quantity of pine-apples are wasted because they ripen later than the time the coasting steamers usually stop running. If a variety of pine-apple could be found which would ripen even a fortnight earlier, this would mean an immense benefit to the growers.

Again, when plant introductions are attempted by several individuals living in different parts of the country, the plants naturally come to be tried under varying conditions of climate, locality, soil, etc., so that suitable environments for success are easily hit upon and the result is the general benefit of the country. I know of one case where a certain gentleman in Sâtára District has been able to grow a few but certainly some of the best apples at present possible in the Deccan merely as a result of ordinary fancy for varietal cultivation. Private nurserymen, rich landowners, especially the latter, are always prepared for a certain amount of loss on their estates as unavoidable, not knowing how to prevent such losses. If such men take a fancy to horticulture, much may be expected of them in the work of trial of exotics.

II.—The second horticultural possibility is the extension of areas under fruit culture. The total area irrigated by Government Irrigation Systems in the Bombay Deccan is 290,000 acres at present, out of which about 57,000 acres, *i. e.*, 20 per cent., is under fruits of all descriptions, including the most minor ones (such as tamarind). This would seem a fairly large area, but a study of the details of the kinds of fruits grown reveals some interesting facts. Plantains and mangoes together take up nearly half the total area (plantains 14,000 acres; mangoes 9,000). But the equally important fruits like grapes and oranges occupy only 377 and 934 acres respectively. This shows how small an area is under such important fruits and the fact is very striking considering their importance as well as the possibility of their being grown on much larger tracts of country than at present.

There are five large irrigation systems in course of construction, namely:—

Nira Right Bank Canal.	} Altogether commanding an area of nearly 632,000 acres, that is, an area more than twice as large as the present irrigated area of Deccan.
Právara.	
Godávari.	
Budihal.	
Gokák Canal Project.	

The Canals are expected to command large tracts in Sangamner, Rahuri and Kopergaon Tálukas, Bhor State, Phaltan State, Pandharpur, Saugola, Bijápur, Sinnar, Niphád and Yeola Tálukas, etc. All these places are certainly well adapted for growing one or another of the several kinds of fruits and many of which are already cultivated though not to any large extent in the tracts mentioned. I may also state that grapes could be successfully cultivated in places like Ahmednagar, Ratnágiri, Bijápur, Poona, Purandhar, and some parts of Khándesh. But at present Násik is the only place which sends its quota to the Bombay markets. In the times of the Mahomedan rulers, grapes were cultivated in Bijápur and Ahmednagar for the royal tables. Also, it is said, that in times of the Peshwas (1791) Hirekodi in Belgaum District owed its prosperity in those days to the extraordinary size and flavour of its grapes, and there is no reason why it should not be possible now.

In addition to the abovementioned localities, I might add the following tracts that are suitable for growing fruits, *i. e.*, tracts from Pálghar to Umbargaon, Kalyan to Karjat, and round about Janjira; and the tract of about 8 miles long from Mumbra to Panvel and round Panvel. There are also very good areas suitable for both fruits and vegetables near Ratnágiri. In Dápoli Táluka there are favoured localities with perennial streams where delicate fruits and vegetables can be grown and where transport is easy. It is also probable that suitable areas in the Konkan commanded by the waste water from the Tata-Hydro-electric scheme would be available for fruit culture in the near future.

Fruits and vegetables do not require as much water as sugarcane. An extension of cultivation of the latter may spoil the lands by increase of salt efflorescences, and also affect injuriously the sanitation of such localities. But no such fear need be entertained by planting extensive tracts with fruits, since in their culture the lands need "drying off" for some period of the year; besides there is little chance of excess of water being used, as any practice of the kind is likely to result in failure of the fruit crops. The profits of sugarcane may be slightly in excess of these from fruits, with, of course, a corresponding

larger outlay. Besides it is doubtful if the price of sugarcane products will maintain the same high level as at present if such large additional areas—areas about three times as large as already irrigated—are planted with sugarcane alone, while the local consuming capacity remains unaltered. On the other hand, the demand for fruits and vegetables in the Bombay market is increasing enormously. People have now commenced to consider rightly that fruits form an article of food and it is in their interest that the latter should be made as cheap and profitable as possible so that they may be available in the dietary of the middle, and if possible of the poorer classes too, so that the general standard of health of the nation will rise slowly but surely.

At present the culture of important fruit trees is confined to extremely localized spots in the country. Poona, Násik and Ahmednagar are the only ones of consequence apart from the areas under plantains which are grown all over the Presidency and mangoes chiefly in Konkan only. This limitation of cultivation to a few localities is certainly an unsatisfactory feature of the industry especially when climate, soil and irrigation facilities are available in many tracts. I, therefore, urge the public to have an eye upon convenient sites under the various irrigation systems which may be opened in the near future and plant them with fruit. The prospect is bright and investments required are not usually heavy.

III.—The next possibility is raising highly valued vegetables. An exhaustive list of vegetables cultivated in the Presidency gives 30 names of indigenous kinds and about 20 of foreign ones. Most of these are cultivated on a small scale, too small to suffice even for purely local markets. Distant markets are not at all exploited. Besides very hardy kinds only are cultivated for marketing and others are not known even to professional men. The most prized vegetables in the Bombay and other large markets are the European vegetables, *viz.*, cabbages, cauliflowers, Brussels sprouts and Asparagus. Out of them, the cabbage is the only one that is cultivated to an appreciable extent. The area under this crop is, however, only 439 acres in all. Out of this area 174 acres are cultivated in the Poona District alone and 80 in Thána. The areas under it in other districts vary from 20 to 40 acres, while Bijápur, Khándesh, Panch Maháls and Sholápur Districts claim only one acre each. It will thus be seen that growing of vegetables on a large scale is practically unthought of in Western India so far. The present distribution of these vegetables shows, however, that there is no climatic difficulty in the way of extension of the cultivation in all districts. In addition to the vegetables mentioned above, leeks, parsnips, endive, artichokes, etc., can be grown quite well under almost similar conditions of weather and soil. With extended irrigation facilities more area could be put under these. The prices realised by these classes of vegetables are high and the returns quick. A certain amount of enterprise is, however, needed to export local produce to large markets when there is not enough local demand. For instance, Belgaum grows good English vegetables, but the produce is not sent to Bombay although there are the best possible transport facilities. Next to fruit growing, vegetable culture seems to me to be full of possibilities.

IV.—Export of fruits is the *fourth* possibility which suggests itself to me. I understand that such important fruits as oranges and sweet limes are not only not exported to England, but, on the other hand, they are imported into the Bombay markets from such places as Hong-Kong. Other fruits come from distant countries, such as Australia, Spain and Italy. Grapes grown in the Presidency are not sufficient even for local consumption, while the little export of mangoes is a negligible quantity. In the matter of citruses, I think, India should be able to stand competition with the West Indian Produce in the London market. An actual experiment with Musambi fruits proved that they will keep for 23 days without cold storage in moist atmosphere of July in Poona; therefore there is no fear of the possibility of their rotting during transport. A similar keeping quality is almost certain in other citrus varieties. If plantains could be exported in ship-loads, there is almost an unlimited field in the business. Because areas under it can be extended almost indefinitely and the people are very proficient in their culture. Besides if any good drying and preserving process is worked out, the possibilities seem unlimited. This is a matter worthy of careful and businesslike consideration. The business side of the question can be taken in hand by Bombay people who have export facilities and commercial instincts. The business when once established is bound to grow in proportion with increased fruit culture.

V.—The next thing I suggest is the *Preservation of fruits*. Here again one sees an immense scope, for example, in the case of figs which are dried in such numbers in Asia Minor. The canning of mango fruit (not juice) is also a line worth trying. There is a mango juice canning company at Honávar which has solved the problem of mango juice preservation. Such concerns require an almost unlimited supply of fruit of uniform quality for their business. Here lies another chance for the fruit grower in producing fruit of the needed quality for packing and canning firms.

VI.—The next subject offered for consideration is the necessity of "*Co-operation among fruit growers*". The benefits of co-operation in general are too well known to need detailing here. But co-operation of fruit growers have special advantageous consideration. Such co-operation societies have been formed in America, where they are working with consider-

able success. Co-operation among fruit growers is likely to be attended with specially good results in a country like this where the growers are wholly at the mercy of the middlemen. A co-operative society of fruit growers is able:

"(1) Practically to dictate its own price for joint benefit. (2) It can meet on equal terms with the purchaser. (3) Wholesale dealing is possible, say, for buying manures, spraying and packing materials. Besides, (4) an association controlling joint business secures better terms for transport by Railways. (5) A joint representative can deal expertly for benefit of all in marketing and studying market conditions. (6) Such co-operation enables disposal of even small quantities to advantage and enables members to know dates of gluts in the market [Notes from Report on *Missouri* (U.S.A.) experimental station work]."

Such a co-operative society should be feasible at Násik, which is the only important grape vine cultivating centre in the Presidency proper. Here the cultivator is practically at the mercy of the Bhagwan under the "*Afát Asman*" system of purchase of produce. The vineyardists need spraying materials and manures. All these could be much more profitably secured and large risks avoided by forming a *Grape Growers' Association*. The position of the Násik grape growers is unique in this respect. They can even go the length of establishing a brand of their association which may become well known in the market and thus secure stability of the industry finally resulting in extending and improving the vineyards. Similarly an association of plantain growers of Bassein would be a great improvement. The Bassein plantain growers complain of the high prices of manures, large quantities of which must be applied. Co-operation may solve the difficulty. "The success of the Mutha Co-operative Manure-supply Society is an instance in point. Similar efforts in other places are bound to be crowned with success and the horticultural interests of the country may thereby be furthered for the general good."

Lastly, let me allude to the business of *nursery men* which seems to me to be full of possibilities. The present position of the business is far from satisfactory. In the first place, the nursery men seem to content themselves with merely importing foreign seeds and bulbs for sale and they seem to think that their business is ended when they have disposed of their imported stock. They seldom give a thought to raising their own seed or to acclimatising foreign plants: things which should properly form part of their business. The methods of business of the average nurserymen leave also much to be desired. I have known for instance cases of nurserymen who did not know how many varieties of roses they stocked. The plants of grafts supplied by some of them do not always come true to name. I am not sure that the remarks made by Mr. Hartless, Superintendent of the Saharanpur garden with regard to the nurserymen of that place do not apply with equal force to some at least of our nurserymen. In his annual report for the year ending March 1913 he says:—"I could give many instances of the utter ignorance and even unscrupulousness of so-called nurserymen and seeds men. The great majority, at least, of such persons enter this kind of business simply with the idea of making all they can in as short a time as possible. There is no thought of establishing a permanent reputation, and, moreover, such people know little or nothing of the technique of the business; There is, of course, less danger when they deal solely with imported stuff, but it is a different matter when they attempt to deal with their own produce. I know firms that catalogue a long list of acclimatised seed, when they have not a yard of land for growing such."

To my mind there is now a great future for this kind of private enterprise. The æsthetic sense of the people is decidedly on the increase as a result of contact with western people. We are no longer satisfied with growing a few flowering plants merely for worshipping gods but we are beginning to love flowers and flower gardens for their own sake. The nurseryman can help the development of this æsthetic sense and use it to his advantage too. Again, if all the horticultural possibilities which are indicated above come to be realities—and I do not see any reason why they should not—then it is to the nurseryman that people will look for supply of genuine seeds and grafts of superior varieties. At present the nurserymen are not in a position to supply even the existing moderate demand for superior kinds of plants. If they look further ahead than merely contenting themselves to be importing agents, then they will awaken to the necessity of devoting their attention to raising their own seed and acclimatising exotics and to experimenting in various ways to help on horticultural progress. They will then endeavour to keep themselves abreast of their brethren in other countries and try to introduce novelties every year. They may also then be expected to lay out ornamental gardens for private individuals and advise on gardening matters in general. At present, they, with a few exceptions perhaps, hardly seem to be in a position to do so. In this way it will be seen that we may look to the nurserymen and seedsmen to be the centres from which the horticultural movements will spread all over the country.

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THE FEEDING OF PRICKLY PEARS AND COTTON HULLS.

During the month of August 1912, a letter from Mr. Norton (American Missionary) of Dhond appeared in the *Bombay Guardian*, drawing attention to the value of prickly pear as an emergency ration when properly prepared and fed.

In October of the same year, Professor J. B. Knight, of the Poona Agricultural College, visited Dhond and inspected Mr. Norton's work. In a note on his visit, Professor Knight reported that the experiments had every appearance of being genuine, but that Mr. Norton had no record to show the cost of preparation.

An experiment was commenced at the Government Civil Dairy, Kirkee, in January 1913, and owing to the satisfactory results obtained there, demonstrations were commenced at the cattle camps which had been started in the Ahmednagar District with the object of saving cattle which were being lost owing to the fodder famine.

Object.—The object of the experiment at Kirkee was to place beyond doubt the possibilities of cactus as an emergency ration in times of scarcity, to decide the best method of preparing and feeding it, and the cost of preparation.

Animals used.—Six bullocks were purchased in the famine-stricken district of Ahmednagar for this purpose. They were in exceptionally poor condition on arrival, with the exception of one bullock, which was in fair condition.

Kind of pear used.—The pear used was the common variety, which is to be found anywhere along the road sides, on waste land, etc. The chemical analysis of the pear, made during both wet and dry seasons, was:—

				Wet season.	Dry season.
Moisture	...	...	...	92.65	79.32
Ether extract	...	...	...	.22	.78
Albuminoids	...	...	...	.31	.68
Soluble carbo-hydrates	...	...	...	4.37	11.61
Woody fibre	...	...	...	.85	2.48
Ash	...	...	...	1.60	5.13
			Total	100.00	100.00
Containing Nitrogen	...	...	...	0.49	.11
Containing Sand	...	...	...	.12	.04

Preparation.—The spines were removed by burning, several types of "Primus" stoves being used for the purpose.

The price of the stoves and the cost of preparing the pear with the different varieties were:—

Name of stove.	Price.			Quantity of pear prepared per hour.	Cost of preparation.		
	Rs.	a.	p.		Rs.	a.	p.
Primus No. 1	...	5	12 0	31 pounds	0	1 2	
" No. 2	...	8	12 0	31 "	0	1 2	
Vesuvius (flat flame)	...	15	8 0	60 "	0	1 5	
Vesuvius (round flame)	...	15	8 0	55 "	0	1 5	
Etna	...	10	8 0	50 "	0	1 7	
Petrolia	...	13	0 0	55 "	0	1 3	
Effective	...	22	0 0	100 "	0	2 0	

The price of oil has been calculated at Rs. 2 per tin and labour at Rs. 0.5-0 per day. The results arrived at are the average of a large number of trials.

In burning, it is necessary to be careful that the pear is properly burned; otherwise the pear will be refused by the cattle. Previous failures are most likely due to the imperfect removal of the spines. However, no matter how much care is exercised, some very fine hair-like spines will be left, but these will have no effect. Of all the stoves tried the "Effective" proved most economical. This stove has a double burner and a flat flame, and will burn 100 pounds of pear in one hour, at a cost of Rs. 0.2-0 for oil and labour, or at the rate of 1,000 pounds per day of 10 hours for Rs. 1.4-0. The slabs after burning are cut into small pieces by passing them through a Smalley chaff cutter, or by chopping them on a wooden block with a knife. The former is of course quicker and more convenient, but the latter also gives good results when the quantity to be prepared is not excessive; the knife used should be similar to that used for chopping kadbi.

Feeding the pear.—As the pear fed alone would not be sufficiently nutritious to form a maintenance ration, an addition of 6 per cent. of cotton seed was included, that is for every 100 pounds of pear, 6 pound of cotton seed were added, and this mixture was fed during

the experiment. At the commencement small quantities of the pear mixture were given with a quantity of chaffed kadbi, the mixture being increased and the kadbi decreased gradually, until after about a week the kadbi was altogether discontinued. Of the six bullocks, four took to the pear readily, and after about ten days ate it greedily. One gave some little trouble, but also ate it readily after having become accustomed to it; which it did after about a month. The sixth bullock, however, gave a considerable amount of trouble, and only commenced to eat the pear at all readily towards the end of the experiment. In this case the cause was most likely the very emaciated condition in which he arrived and commenced the experiment, for it was difficult to get him to eat sufficient good fodder to regain condition.

Results.—The first result to be noticed was the colour and consistency of the fæces and the excess of urine. The fæces were of a slatish colour, and showed tendency to become too liquid, but at no time were they so liquid as to suggest scouring, nor was there any offensive smell. The urine was somewhat in excess in quantity, but appeared quite normal in quality. At the beginning of the experiment there was a loss of weight varying from 2 pounds to 60 pounds; this, however, was very soon made up, and a steady gain in weight was made, until a maximum was reached, after which the weights were practically constant. The greatest gain was 70 pounds. The average quantity of pear consumed was 32 pounds per head per day, varying accordingly as the pear contained more or less moisture. This average works out to 72 pounds per 1,000 pounds live weight. Taking the average analysis of the pear and cotton seed, we find that we have a maintenance ration giving:

	Protein.	Carbo-hydrates.	Fat.
Pear	·24	3·84	·24
Cotton Seed	·48	·96	·50
Total	·72	4·80	·74

Comparing this with Haeker's standard, we find a slight deficiency in carbo-hydrates, but this is practically made good by the excess in fat. Haeker's standard requires 7 lbs. protein, 7 lbs. carbo-hydrates and 1 lb. fat, so that the pear mixture is only deficient by ·58 lbs. carbo-hydrates, after the surplus fat and protein has been converted to this nutrient. This deficiency is of no particular importance, as Haeker's standard is a very high one, and, if compared with some of the lower ones, a small margin of excess would result.

As the weight of the animals increased, their appearance improved. At the commencement of the experiment they all looked dull, miserable and emaciated, with staring coats, but they rapidly improved, and after six to eight weeks they appeared like totally different animals, their coats became smooth and glossy, eyes bright, and they had a general appearance of health and well-being.

The pear was also fed to 19 cows and 19 buffaloes which were in milk, mixed with their ordinary feed, which was proportionately decreased in quantity. It was given upto 14 pounds per head per day, and after three or four days they ate it readily. The object was to find out if the succulence of the prickly pear was of any value for increasing the milk yields when no other green fodder was available, but for various reasons we were obliged to discontinue this part of the experiment without getting any decided results. This will be tried again later. The dry cattle and young stock of the dairy at Mánjri were also fed the pear with a mixture of cotton seed hulls, cotton seed and molasses. The feed consisted of 19 pounds of pear, 8 pounds of cotton seed hulls, 1 pound of molasses and 1 pound of cotton seed. The animals had fallen off condition owing to the grazing having become scanty, but when put on the feed abovenamed they rapidly regained their former condition. They exhibited no signs of abnormal looseness of the bowels at any time, neither did they require any coaxing to eat the mixture, even on the first day. The bullocks did not take any water worth mentioning, except when salt was added to the pear, but with the addition of 2 ounces of salt, they drank a normal quantity.

Summary.—To sum up, it has been clearly demonstrated that the prickly pear if properly prepared and mixed with 6 per cent. of its weight of cotton seed, is not only enough to support life, but will enable an animal to regain condition even after it has become very poor from semi-starvation, that the cultivators could save their cattle in times of famine by feeding the above, the cost of preparation being very low. With the "Effective" stove, enough pear could be prepared for a pair of bullocks, weighing 1,450 to 1,500 pounds at a cost of Rs. 0-1-6 for oil and Rs. 0-3-3 for the necessary cotton seed, or a total of Rs. 0-4-9 per pair per day. One stove would be sufficient to burn pear for 10 pairs. The pear was used with profit at Mánjri for the dairy dry stock when fodder was dear, and effected a considerable saving. It is profitable to feed it as a part of the ration at any time when fodder is scarce and prices are high. No ill-effect was noticed at any time throughout the whole six months of the experiment, and it is still being carried on to find if there will be any ill-effect produced by feeding it for a much longer period. A point worthy of notice is that, although the stoves used worked well if properly managed, and the directions which accompany them are carried out, they will soon go out of order if carelessly handled or negligently treated.

As a result of these experiments, demonstrations were started at the cattle camps in the Ahmednagar District to demonstrate to the public the value of prickly pear in time of famine and to induce them to feed it to save their cattle.

Cattle used.—Eleven bullocks were specially purchased for demonstration, as the cultivators were in the beginning unwilling to loan their bullocks for the purpose, as they feared that injurious results would follow the consumption of the prickly pear.

Stations.—Demonstrations were given at Ahmednagar, Láksh and Miri.

Method of preparation.—This was the same as at Kirkee.

Results.—The consumption of pear per 1,000 pounds live weight averages 58 pounds, but in addition to this 10 pounds of hay per 1,000 pounds of live weight were fed. Cotton seed was added to the ration as at Kirkee. The total gain in weight was 84 pounds, the maximum being 25 pounds and the minimum minus 13 pounds. This is a considerably better ration than the Kirkee one. Owing to no rain having fallen at Ahmednagar, the pear was very dry, and therefore contained a higher percentage of nutrients than at Kirkee. No analysis is available, but for comparison an analysis made at Kirkee during the driest season has been taken. This shows that the animals consumed digestible nutrients per 1,000 pounds live weight :—

	Protein.	Carbo-hydrates.	Fat.
58 lbs. prickly pear ...	·26	4·49	·30
10 „ hay ...	·23	2·86	·17
4·17 lbs. cotten seed ...	·46	·93	·50
... Total	·95	8·28	·97

This, compared with Haeker's standard, after supplying maintenance, leaves available for work ·25 Protein, 1·28 carbo-hydrates and ·87 fat.

The bullocks were given light continuous work, such as harrowing, sowing, and bringing in the necessary prickly pear.

The condition of the animals at the beginning was poor, and they remained practically in the same condition throughout the demonstration.

The cost of preparing the pear was, taking labour into consideration, somewhat higher than at Kirkee, but there was no appreciable difference in the oil consumption.

No ill-effects due to feeding the pear were noticed. At Kirkee, as already noted, the bowels were considerably relaxed, but at Ahmednagar this was not so owing to dry fodder being fed in combination with the pear.

After the demonstration had been in progress a short time, cattle in gradually increasing numbers began to arrive at the camps, the fear which the cultivators entertained at the commencement having disappeared after observing the result of feeding.

The strength of the camp at Ahmednagar was about 800 cattle, at Láksh about 500, and only 16 at Miri. Those at Ahmednagar were fed pear, dry grass and cotton seed. At Láksh about 120 cows were fed pear and cotton seed without any additional fodder, while the balance were fed as at Ahmednagar.

When the camps were closed owing to improvement in local conditions, a number of cultivators at Láksh borrowed the stoves from the camp and continued to feed the pear to their cattle at their own expense.

At the request of the Indian Cotton Oil Company, Limited, of Navsári, experiments with the feeding of cotton seed hulls and decorticated cotton seed meal were carried on simultaneously with the prickly pear experiments.

Object.—To compare the value of cotton seed hulls with kadbi, and that of decorticated cotton seed meal with safflower cake.

Cattle used and details of the experiment.—For this experiment 8 cows and 8 buffaloes in milk were selected. These were divided into four groups, each group consisting of 2 cows and 2 buffaloes. For comparison, Group "A" was fed the usual ration while Group "B" was fed cotton hulls, in place of kadbi during the final trial. This order being reversed for the second trial. Group "C" was fed the usual ration, while Group "B" had the safflower cake replaced by cotton seed meal. This order was also reversed for second trial. After the conclusion of these two experiments, the whole of the cattle were divided into groups for experiment No 3, each group, consisting of 4 cows and 4 buffaloes. Group "A" was fed ordinary ration for comparison, and Group "B" had kadbi replaced by hulls and cake replaced by meal. This order being reversed for second trial as in the two preceding experiments. The duration of each of the experiments was 42 days, divided into four periods, first 7 days for preparation, second 14 days for first trial, third 7 days for gradual change from one ration to the other, and fourth 14 days for second trial. The

weights of the animals were recorded at the commencement and conclusion of each period, and a careful record of the milk yields kept throughout. The experiment was somewhat marred by two cases of sickness and several cases of slight indisposition, which, though not serious enough to be termed sickness, were still sufficient to put the animals off feed and reduce their yields temporarily. Of the two cases of sickness, one was a case of abortion; but as the cow aborted during the first trial of experiment No. 3, while she was on the usual ration, and had been so fourteen days, it is most probable that the abortion had no connection with the cotton seed products. The second cow which was sick suffered from indigestion and constipation, which may or may not have been due to the hulls, as it occurred at the commencement of the first trial in experiment No. 1.

Results.—The results show that there is little or no difference between the feeding value of hulls and kadbi. The hulls, according to analysis, are richer in albuminoids than the kadbi, but owing to their not being so digestible there is a considerable portion of the nutriment expended in the process of digestion.

In experiment No. 1, Group "A" gave less milk on hulls than on kadbi, while Group "B" gave the most milk on the hulls. In experiment No. 2, Group "C" gave most milk when fed safflower cake, while Group "B" gave more milk when fed meal.

Similar fluctuations occurred throughout all the experiments, both with regard to the weight of the animals, as well as the milk yields. For instance, while Group "A" was increasing in weight and giving more milk on the ordinary ration, Group "B" was doing precisely the same on hulls.

The conclusion is that cotton hulls are equal in feeding value to ordinary dry kadbi, weight for weight, and comparison of prices will decide which is more economical.

With reference to meal it is also a matter for comparison of prices, but as meal is much richer than any of the cakes, comparison must be made on the basis of composition and not weight.

After the conclusion of the experiments the whole of the herd was fed on hulls (the hulls being gradually introduced), owing to the dearness of kadbi. After some time owing to the failure of the Company to supply hulls (due to some question of freight with the Railway company) it became necessary to again feed kadbi. This change caused a considerable drop in the milk yield. The drop in the yield was most likely due to the sudden change in the ration, and the same would most probably have resulted had the change been from kadbi to hulls.

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PROGRESS OF COTTON IMPROVEMENT ON COLLEGE FARM.

What I intend to deal with in this paper is what we on College Farm have achieved and are attempting to achieve in the way of cotton improvement in general as well as with special reference to the other Deccan districts which are either growing cotton to some extent or are likely to grow.

The lines of work which we have taken up and in which we have obtained some results are:—

(1) Improvement of seed

(a) by eliminating the inferior seeds from the present seed-supply as it stands,

(b) by developing and establishing high yielding strains by plant to plant selection,

(2) Improvement in the outturn by better cultural methods, consisting of tillage and manuring.

(3) Ascertaining types of cotton which will produce the largest money returns, under the Deccan conditions.

1—Improvement of Seed.

Elimination of the inferior seed from the present seed-supply.—An examination into the supply of cotton seeds as used in the different districts of the Presidency by Mr. G. D. Mehta (*vide* Bulletins Nos. 37 of 1910, 43 and 49 of 1911 and No. 50 of 1912) brings out that the quality of cotton seed used for sowing is very inferior indeed, the germination percentage on an average hardly exceeding 56 per cent. This means that the cultivator has to put in, at double the cost, about twice as much seed as would be required if it was all good. A machine was devised by Mr. Mehta and myself to eliminate the light, broken, hollow, weevil-eaten seeds; by this machine it is possible to reject 25 per cent. of the seed, which is almost unfit to go into the soil as seed. The germination of the seed obtained on separation has improved from 35 to 84 per cent. in cases where the original unseparated samples were very poor, that is, of about 40 per cent. germination, and only about 10 per cent. where the original samples themselves were of superior quality, *viz.*, having about 80 per cent. germination. The machine and the results obtained with it being fully described in Bulletin 53 of the Bombay Department of Agriculture, I do not wish to go into further detail.

The laboratory methods which were used in the above bulletin for basis are not however able to test any other advantages besides the germination, that are likely to be obtained in a good seed, such as the power of survival to maturity, individual productivity and quality of the produce. This can only be found by field trials. Three varieties—Broach, Khândesh, and Dhârwâr-American—representing the three important cotton growing tracts were, therefore, experimented upon last year on College Farm. The results point out that—

(1) The germination in the case of separated seed shows an improvement of 8 per cent. in Dhârwâr-American, 16·2 in Khândesh and about 23 per cent. in Broach.

2. It was observed that there is not only a gain in germination, but the plants that germinated from the treated and untreated seed had not the same power of survival. A larger proportion of germinated plants survived to maturity in the case of separated seed than in the unseparated, the actual gain in this respect being 4 per cent. in Khândesh and 9 per cent. in Broach.

3. Then again there is considerable difference in the individual productivity of the average plant from each lot. There is no gain in Khândesh, it is 7·2 per cent. in Broach and 77 per cent. in Dhârwâr-American.

4. The ginning percentage is also in favour of the separated seed by 2·4 in Khândesh, 4·8 in Dhârwâr-American and 6·8 in Broach.

5. In point of quality, the valuation by Messrs. Tata and Sons shows a gain for the separated seed of 2·8 per cent. for Dhârwâr-American, 5·1 for Broach and none for Khândesh.

Thus, apart from germination, the separation gives a total increase of 85 per cent. in Dhârwâr-American, 29 in Broach and 5½ per cent. in Khândesh, which is due to other factors than germination.

One fact that is noticeable in the results is that the improvement in any of Khândesh and Broach is much less than that of Dhârwâr-American, though the original samples of

the former two were much poorer than that of the latter. It is indicated that the machine we have devised has been more suitable for the large size and specific gravity of cotton seed, as that of Dhárwār-American, and some modifications may be necessary for the smaller sized seed like that of Khándesh and Broach to obtain the best results.

One might say that the losses due to the inferior quality may be made up by increasing the seed rate proportionately to the poorness, which will not cost more than rupee one per acre at the most. Though the amount per acre may seem insignificant, when we take into consideration the entire area from the whole Presidency under this crop (1911-12), the extra cost due to bad seed amounts to nearly 40 lacs of rupees.

A little consideration, however, will lead one to think that this is not all; increasing the quantity of seed does not solve the question satisfactorily; for it is far from likely that a sample of seed, especially like that of cotton, will be so regular as to fall through the sowing machine in an evenly distributed mixture of good and bad seed. In some places a majority of poor seeds may fall, giving many vacant spaces, while in others, many good seeds may be crowded together necessitating thinning. At the stage the thinning has to be done to get the best results, it will be impossible to distinguish plants which would have a better survival and producing power from those poor in these respects, and possibly good individuals may be weeded out.

One can thus easily understand the several benefits which the system of treating seeds by the method described above will give to the cultivators. Although these experiments are based upon a small area of 1/24 acre only, and for one year, they are so striking that they are worthy of careful attention in the cotton-growing tracts of the Presidency. The machine, as it is modified from an ordinary winnower, costs Rs. 100, but it is estimated that it would not cost more than Rs 50, if one is made for this purpose only. This is not, of course, within the means of each small cotton grower, but it can be easily put into practice on Co-operative lines or by seed merchants. The seed can be cleaned in the summer in the leisure of the farmer and safely stored until required for sowing.

As a side observation, I wish to point out the very low germinating percentage of cotton seed in general as compared with other crops. It is found that this is not only attributable to ginning factories, as carefully hand-ginned cotton seed on College Farm did not give over 70 per cent. germination. This indicates other causes, such as not selecting out separately at the time of picking only the healthy well-ripened bolls free from insect attacks, insufficient drying, improper storage, etc., which can be only settled by further investigations.

Improvement by plant to plant selection.—On closely inspecting a cotton field, various sizes of plants are noticed, some yielding a larger number of bolls than other. If further accurate test is taken, it is observed that some plants have a finer staple, better colour, or greater ginning percentage. The causes of this may be injured or sound seed, local environment or accident, or hereditary influence. While, for instance, it is observed that the average outturn of each plant of Khándesh cotton on a field scale in a normal year is nine grams or about $\frac{1}{2}$ tola of seed cotton, the average of 200 of selected plants out of $\frac{1}{2}$ an acre is 27 grammes; when these were further analysed, they gave the following proportion:—

Below 9 grammes	...	...	13 per cent.
From 10 to 18	...	...	20 "
19 to 27	...	...	20 "
28 to 36	...	...	22 "
37 to 45	...	...	13 "
45 to 54	...	...	9 "
Above 54	...	...	3 "
			100 "

This shows what a large variation exists between the different plants. Now if the influencing factors of unsound seed and local environment and accident could be eliminated, and the hereditary influence separated out, it would be possible to increase the outturn considerably by sorting out plants with an hereditary power of high productivity or earliness or any other points one is interested in.

We have taken for study the four constituent types of Khándesh mixture, and, have started with 50 apparently best plants of each type in the year 1910, observing each individually, as regards its purity to particular type, its productivity, ginning percentage and quality. The chief aim of selection, is however, the outturn of lint which, after all, is, at present market rates, the determining factor to bring the largest money return to the cultivator. During the last three years, the progeny of these plants is being watched individually and collectively, in order to eliminate such as might have yielded high the first year of selection owing to other causes but heredity. Out of each progeny, the best of course were taken for further development. Out of the 200 original plants, only 14 have been kept as consistently high yielders which must be due to heredity.

The results so far obtained during the last three years, as set out in the subjoined statement, already show that there has been an improvement in the yield due to selection, both

from the basis of the average selected individuals, as well as that of the crop from the offsprings of the selected plants:—

Name of Variety.	The average outturn of lint per plant.				
	On the basis of selected individuals.			On the basis of the crop from the offsprings of the selected individuals.	
	1910.	1911.	1912.	1911.	1912.
Yellow flowered broad lobed ... (N. V. M.)	grammes. 8.1	grammes. 9.32	grammes. 11.04	grammes. 2.80	grammes. 5.94
Yellow flowered narrow lobed . (N. V.)	9.3	6.70	19.27	1.69	5.64
White flowered broad lobed ... (N. R. C.)	10.4	10.7	12.56	2.49	7.23
White flowered narrow lobed... (N. R.)	6.4	8.14	12.8	2.45	7.37

The real improvement can only be judged from the crop on an extensive scale for a series of years, as the influence of the variations of season from year to year may mask the change due to heredity. During the last year the progeny of the selected plants on an area of two acres gave an average yield of 1,048 lbs. of seed cotton per acre as against 925 lbs. from ordinary seed, or a gain of 13 per cent. in favour of the selected. The same comparison is being made this year again from the progeny of individuals developed a year further and about 200 lbs. of seed of each of the improved strains will be available for distribution after the harvest.

The results so far obtained from this line of work show great possibilities of improvement. But this is not again the work of a small farmer, but offers very good opportunities to wealthy land lords who might maintain seed farms for one or two important crops grown in their locality under the direction of an Agricultural graduate. It will not only be a profitable investment of their capital, but will also bring them the credit of having served their country-men by providing better seed.

II.—Improvement in outturn of Cotton by cultural methods.

Taking up the next item, namely, the improvement in the outturn of cotton by better cultural methods, the results obtained on College Farm for the last 6 years under varying conditions of season prove that by better tillage consisting of a deep ploughing by an inverting plough, a thorough preparation of the seed-bed, good seed and proper time and methods of sowing, wider spacing, keeping the field scrupulously clean of weeds and always maintaining an excellent mulch, paying yields, much above the average, can be obtained. This will be easily illustrated by the figures of outturn obtained for the cotton crop during the last six years which are given in the following statement along with the figures of the rainfall of each year:—

Year.	Total rainfall.	Name of variety.	Total area under cotton.	Nature of soil.	Outturn of seed cotton per acre.
1907-08 ...	Inches. 39.78	Broach ...	A. gts. 0 10	Medium black ...	Lbs. 1,134
1908-09 ...	23.34	{ Varadi ... " ...	0 20 4 23	Medium black ... Light soil ...	840 577
1909-10 ...	16.45	{ Broach ... Varadi ...	0 20 1 0	Good medium black. Do. ...	1,031 605
1910-11 ...	32.45	.....	Failed owing	to frost.	...
1911-12 ...	13.72	{ Broach ... Varadi ...	1 4 3 26	Good medium black. Medium black ...	597 512
1912-13 ...	23.28	{ Broach ... Varadi ...	1 10 4 0	Do. ... Good medium black.	850 1,019

It must be stated here that the outturns recorded above were all obtained from crops depending on rainfall alone.

III.—Improvement in Cotton by finding out suitable types.

There remains only this point to be dealt with. The Agricultural Department have not yet got much to recommend about the types of cotton suitable for the Deccan districts, namely, Poona, Násik, Nagar, Sholápur and Sátára. The Poona district at least has always been left out with the supposition that it is not suitable for cotton-growing. The results of outturn obtained on College Farm, and quoted elsewhere above for the last six years, lead, however, to the conclusion that this supposition is not correct. In Poona district there is a large area which has similar conditions of soil and rainfall as obtained on cotton fields on College Farm. Sátára and Násik have almost identical conditions as Poona, while Nagar and Sholápur are even more suitable for cotton. The fact that in all the above districts the cultivation of cotton is increasing confirms the above view. The experience gained on College Farm induces one to fix the zone of cotton cultivation in the Deccan within 20 to 30 inches of rainfall and fair medium black to deep black soil.

It is quite important to know, therefore, which will be the most appropriate type of cotton for these districts. Considering the uncertain, deficient and irregular rainfall in parts of the districts where cotton is likely to grow, the variety of a short growing period and resistant to precarious conditions is indicated. The Khándesh or Varadi type is of such a nature and seems suitable for all the Deccan districts except the Southern Sátára, where a better quality of cotton is being already grown.

The usual Khándesh type is, however, a mixture, chiefly of four sub-types, and it is, therefore, necessary to fix upon one of these which will be the most paying. For Khándesh conditions *neglectum roseum* has been found the most desirable, but whether the same will prove similarly in other districts cannot be said without experiment.

No experiments were carried out in this line on College Farm till the last year. But those undertaken last year point out that, white flowered Cutchica is a long way ahead of the other types in gross money returns per acre, as will be seen from the following data:—

Name of Variety.	Outturn of lint per acre.	Valuation per khandi of 784 lbs.	Gross money value per acre.
	Lbs.		Rs. a. p.
Khándesh fresh seed— (mixture)	280	225	78 9 0
Roseum from Berar— (N. R.)	292	220	81 15 0
Malvensis from Berar— (N. V. M.)	208	240	62 6 6
White flowered broad lobed— (Farm selected N. R. C.) ...	419	220	117 9 0
White flowered narrow lobed— (Farm selected N. R.)	329	215	90 5 0
Yellow flowered broad lobed— (Farm selected N. V. M.) ...	249	240	73 14 9
Yellow flowered narrow lobed— (Farm selected N. V.)	268	230	78 10 0

With regard to the possibilities of growing superior quality cottons in the Deccan, the last six years' experience of College Farm with crops of Broach cotton depending only on rainfall, gives very sanguine hopes of success of this variety in suitable dry tracts of the Deccan. From the figures of outturn already given elsewhere above, it will be seen that this cotton has given extraordinary yields under conditions of rainfall, varying from 12 to 39 inches. Of course the best types of medium or deep black soils not less than 18 inches deep were devoted. The soil was deeply ploughed and well prepared before the rains and a good stand of seedlings obtained by sowing seeds three feet apart between rows and 1½ feet between seed to seed in a row. It was observed that after the early monsoon rains had once sufficiently saturated the soil, the crop could be pulled along till the Rabi rains by maintaining a fine mulch. One deep intercultivation after the Rabi rains at the time when bolls begin to form was all that was necessary to secure the maximum crop.

With these precautions I am quite hopeful about the extension of Broach cotton in parts of the Deccan possessing the above specified soil and seasonal conditions. The latter it is possible to imitate by artificial irrigation provided some judgment is used and the other cultural directions followed. Excess of irrigation has a tendency to stimulate cotton to vegetative growth at the cost of bolls and to prolong the maturing period. I suppose this, in addition to defective cultural methods, may have been the cause of the failure in the attempt of the British Cotton Growing Association to ascertain the chances for Broach cotton in the Deccan under irrigation some years ago.

Broach cotton, given all its requirements, has always given larger money return on College Farm than Khándesh. It is further noticed that at the time this crop begins to yield on this farm (March-April) the damage due to red cotton bugs and boll-worms is considerably reduced, while at the time of the earlier Khándesh cotton coming in, the damage due to these pests is excessive. Broach cotton has one more advantage in that it yields its pickings very rapidly in the forcing weather that obtains in March-April, unlike Khándesh, which in the cold season (December-February) lingers on, necessitating numerous small pickings which increase the cost on this item.

It is also observed that the quality of the produce from Broach cotton grown on this farm is slightly inferior even in the first year of its cultivation from fresh seed, and continues to deteriorate. But this difficulty can be obviated by importing fresh seed every year, which will not cost much extra.

The Hirsutum types of cotton do not at all seem suitable for this tract. Buri and Cambodia were tried for the last two years without any marked success. If at all, Buri seems better adapted than Cambodia.

This is all I have to say with regard to the progress of cotton improvement on College Farm. From what I have said, the following conclusions may be drawn, some of which may be provisional:—

1. The quality of cotton seed used for sowing is very poor and that the separating machine adapted by Mr. Mehta and myself has been able to improve the quality to an appreciable extent.
2. It has been shown that a considerable improvement has taken place by plant to plant selection.
3. Proper cultural treatment of the soil gives good outturn even under unfavourable conditions of rainfall.
4. White flowered neglectum seems to be more suitable to the Deccan under ordinary conditions of soil, season, cultivation and care devoted to this crop.

Broach amongst the superior types gives considerable promise even as a dry crop provided every item of its cultivation is properly attended to.

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IMPROVEMENT OF COTTON IN THE SOUTHERN MARATHA COUNTRY.

The importance of cotton is beyond numerical expression; for, while the total crop of any one country or of the world is approximately ascertainable, the effect of cotton upon the commercial and social relations of mankind is far beyond estimation. Cotton stands pre-eminent among farm crops in the ease and cheapness of its production and is the chief "Money Crop" of the cultivator. The plant makes little drain upon the fertility of the soil, and while yielding the fibre which is utilised for innumerable purposes and chiefly the clothing of man, it also yields, from its seed, oil and cake. Cotton forms the chief rotation at least in our part of the world for jowari, the staple food of the cultivator.

In the Bombay Presidency cotton is a very important crop and the area under it represents about one-third of the total area under cotton in the whole of India. This presidency is also characterized by the diversity of the varieties of cotton grown. Before mentioning the improvements brought about by the Agricultural Department in the case of cotton of the S. M. Country and the possibilities of further extending them, I may briefly describe the present condition of the local cotton crop in the Southern Maratha Country.

In this tract there are two types of cotton grown, *viz.*, (1) Kumpta or jowari cotton and (2) Saw-ginned Dhárwár-American or Vilayati cotton. The first type, *viz.*, Kumpta, is the predominating variety and is distributed over almost all parts of the country. It is grown on heavy black soil. The cotton has a fine staple, but the colour is dull and the ginning outturn is only about 25 per cent. The quality of cotton differs from place to place, depending upon the soil and climate. The cotton produced round about Miraj sometimes fetches the highest price in Bombay market. This, I believe, is due to the fact that cotton on that side is generally grown along the fertile banks of the Krishna river. In the Dhárwár District the cotton produced in the talukas of Dhárwár, Hubli and Bankápur is always superior to that grown in other talukas and certainly much better than the crop from the Belgaum and Bijápur Districts. The prices offered in the local markets generally vary according to the places from which the cultivators bring their cotton for sale.

The other type of cotton, *viz.*, saw-ginned Dhárwár-American or Vilayati cotton, is confined to the eastern and southern talukas of the Dhárwár District. As the name indicates, it is an American type of cotton and is the survival of the seed introduced by Government about 100 years ago, when experiments were made in all parts of India and it was found that only in the District of Dhárwár did this American variety successfully become acclimatized. It is since then being cultivated in these parts and has now become a local crop. It now bears very little resemblance to the greatly improved types of the American cotton of the present day. It is grown in the *Kharif* season on red soil and in the *Rabi* or practically *Rabi* season on medium black soils. In the case of this variety also there is variation in the quality of cotton produced in different places. Cotton produced in the Kundgol State is said to be better than in other places. Cotton from red soil is much inferior to that from medium black soil. Unlike Kumpta the colour of the cotton of this variety is quite white, and good samples sometimes fetch higher price than Kumpta. The present high rates of cotton have induced some cultivators to grow this variety every year without rotation in the same field. This practice does not suit the other variety, *viz.*, Kumpta, as it produces wilt. There are two kinds of seeds in Dhárwár-American, *viz.*, green and white; green seed produces better quality of cotton and slightly higher ginning percentage.

Three years ago, under instructions of the Deputy Director of Agriculture, I collected about 100 samples of cotton from several places in the Southern Division and sowed their seeds on the Dhárwár Farm and examined the resulting plants. I found that there was an admixture of Dhárwár-American cotton in many talukas of the Dhárwár District in greater or smaller proportion in Kumpta cotton. Similarly almost all samples received under the name Vilayati contained an admixture of Kumpta. In the Belgaum District, Kumpta was found to be a pure crop. The same was the case in Bijápur District except one taluka, *viz.*, Hungund. In the Sholápur District cotton appeared to be much mixed and consisted of varying proportions of Kumpta, Dhárwár-American and various types of Neglectums, similar to those found in the Khándesh cottons. Sátára grew little cotton only in four talukas. The plants produced from samples of seeds obtained from several gins in Gadag showed that there was an admixture of Kumpta in the Dhárwár-American in varying proportions from 5 to as high as 37 per cent. Only in one case the sample was pure Dhárwár-American.

From these analytical investigations it may be concluded that Dhárwár-American cotton is hopelessly mixed with Kumpta, while Kumpta, though in some places mixed with Dhárwár-American, is not so commonly found in adulterated condition. My personal inspection of several standing crops in the fields also confirms this opinion.

This subject of the admixture of cotton is worth investigating. On enquiry as to the admixture in Kumpta it is learnt that it is a common practice with gin-owners to mix 5-10 or even upto 20 per cent. of Dhárwár-American cotton with inferior classes of Kumpta with the object of improving the colour of the latter. The seed being thus mixed is sold to cultivators who purchase it for sowing purposes. The admixture of seed is never done by the cultivators

at the time of sowing, because they do not prefer to grow the two kinds of cotton mixed, since the two varieties of cottons widely differ from one another, suit different soils and are sown at different times. The reason of the admixture of Kumpta in Dhárwár-American is not clear to me. It is also not clear why the admixture of Dhárwár-American with Kumpta should take place before and not after ginning. Probably this is done to secure thorough mixing of the two kinds of lint. By the method of mixing the two varieties of cotton before ginning there is loss as to the total quantity ginned per hour and also the effect of injuring the knives.

This account of the condition of the cotton crop in the Southern Marátha Country is very suggestive and indicates many lines of work towards improvement. I will allude to some of these later on.

Active work in connection with the improvement of cotton in the Bombay Presidency began about 12 years ago. The first step taken was the collection of numerous samples of seed from all parts of India, bearing local names. These seeds were sown on the Poona and Mánjri Farms. Professor Gammie, the present Imperial Cotton Specialist, carefully studied and thoroughly described the plants produced from these seeds and subsequently published the excellent book, called "Indian Cottons," which gives a systematic botanical classification and which forms the basis for all future study of indigenous cottons. Professor Gammie also made a number of artificial crosses. The work in connection with these artificial crosses was then taken up and carried further by the Deputy Director of Agriculture, and although at present only a few crosses survived, yet it is matter of great congratulation that within a short period of about a dozen years, the improved types of cotton are actually put on the market and are greatly approved by the millowners. The following are the three important methods by which improvement in cotton has been so far made in the Southern Marátha Country :—

- (1) The Introduction of new varieties.
- (2) Hybridization followed by systematic selection.
- (3) Selection in local varieties.

Introduction of new varieties.—In this connection mention must first be made of Navsári cotton. It is now an established fact that this cotton can be profitably grown in those parts which are favoured with early rains. The reason for the successful introduction of this cotton is that although the total rainfall is not equal to that obtained in Gujarát and the soil is not so retentive, yet the amount of rain is evenly distributed between July to October with occasional showers in November. This condition is very suitable for the long period of growth required for Navsári cotton. I shall not speak much about this cotton, because a separate paper on that subject is presented to you by Ráo Sáheb M. L. Kulkarni, the Divisional Inspector of Agriculture, Southern Division, who has been so very instrumental in the matter of the introduction of this cotton and the wide circulation of it among the cultivators. I may only mention that this cotton has been found to deteriorate in three or four years when grown continuously from the same seed in the soil of Dhárwár. For this reason new seed must be introduced from Navsári once in three or four years. The matter of this introduction of seed is rather important, because cotton seed is getting dearer every year. During the current season the rate of the new seed brought from Navsári came to 19 lbs. per rupee. At this rate the cultivator cannot afford to purchase the seed. The new seed had to be sold to them at the minimum rate of 25 lbs. per rupee. With the object of making the rate of seed cheaper than this and seeing that there would be no harm done to the crop by sowing the seed which has been grown in Dhárwár for one generation, a preliminary step has been taken by the members of the Dhárwár District Agricultural Association and they have grown during the present season new seed on an area of about 300 acres. The seed that will be raised from this area is proposed to be distributed to the cultivators on a general scale during the next season at moderate rates. If this plan works well, the members of the Association have decided to devote annually about three hundred acres for the growing of new seed from Navsári.

Another example of the successful introduction of a new variety in the Southern Marátha Country is Cambodia cotton. This introduction is the outcome of the trials of numerous varieties procured from several parts of the world by Mr. Fletcher, the late Deputy Director of Agriculture. This variety is found to be a suitable substitute for saw-ginned Dhárwár in the tract in which the latter is grown. Cambodia, while giving as much yield per acre as Dhárwár-American or sometimes more, gives a ginning percentage of about 7 per cent more than Dhárwár-American and on account of this fetches higher price. The Cambodia cotton is of more uniform staple than Dhárwár-American. The past season unfortunately proved unfavourable to Cambodia, but it is hoped that it will soon regain the favour of cultivators. Experiments are in progress on the Gokák Farm by growing Cambodia under irrigation. If these experiments are successful, there is a good future for this variety in the tract commanded by the Gokák Canal.

Hybridization.—An instance of the success obtained by hybridization is the Kumpta hybrid. This hybrid was originally produced by Professor Gammie by crossing two plants of the Kumpta variety. This hybrid was further manipulated and selected on systematic lines by the Deputy Director of Agriculture. It was grown for some years on the Surat

Farm and was then transferred to Dhárwár. The colour of the cotton is as white as Navsári and the staple is like Kumpta. The ginning outturn of lint is about three to four per cent. more than Kumpta. This hybrid is very suitable for introduction into tracts of the Southern Marátha Country, which are not favoured with early rains. The seed can be sown at the same time as Kumpta. For the present the seed of this hybrid is being distributed in the Bijápur District and there is no reason why it should not be extended to other parts. The cotton of this hybrid fetches about 10 per cent higher price than the pure variety. There are still some promising hybrids on the Dhárwár and Gadag Farms.

Selection in local varieties.—Much can be done in this line of work. For the present on the Dhárwár Farm there is a type of cotton which is a selection of Kumpta. In this case selection was made for some years for length and fineness of staple and afterwards combined with it selection for quantity of lint on seed. The fibre of this selected type has been favourably reported upon by the Bombay merchants. Although the seed of this selected Kumpta has not as yet been distributed to cultivators, still I venture to say that good results are likely to take place if the seed is distributed in place of ordinary Kumpta. In the case of Dhárwár-American cotton green seed has been found to be superior to the white seed. Professor Gammie has recently pointed out the existence of two distinct types of plants in Dhárwár-American. Experiments have been started to separate these two types and to find out which will produce better yields.

Without going into the technical side of the subject I may say that the importance of selection in varieties is very great indeed. The value of a cotton variety depends upon several factors, such as length of staple, ginning percentage, yield per acre, etc. Selection should be made with definite objects in view, keeping of course in mind the total profits. If only the yield per acre is aimed at, we must go on selecting such strains of seed as will always give us a higher yield. If we want to increase the ginning percentage, we should examine and mark such plants as have greater amount of cotton on seed and collect and sow that seed only. Of course there will be a limit to the degree of excellence obtained. The factors, upon which the value of a cotton variety depends, will always vary between certain limits. By methods of selection we can bring these variations into narrower limits; for instance, if a cotton variety has got a maximum length of staple, say $\frac{7}{8}$ of an inch and a minimum of $\frac{3}{8}$, then by systematic selections we can make the length vary, say between $\frac{7}{8}$ and $\frac{5}{8}$ of an inch and thus intrinsically improve the standard of the whole bulk of cotton in this respect. Similar principles apply to other characters also. This kind of systematic selection is unknown in our parts. In American it is said to have been regularly practised and many cotton varieties go by the names of individual cultivators. The very name of a cotton planter is a sufficient guarantee for the particular quality of his cotton.

I shall now conclude by making a few suggestions with regard to improvements of cotton in the Southern Marátha Country. I have said above that the account of the present condition of the cotton crop in this country is indicative of some lines of work. One of them is the organisation of bodies for the supply of pure and good seed. This work can, I think, best be done by Agricultural Associations and other seed Societies, and thus avoid the necessity of a cultivator purchasing seed from the ginning factories for the purpose of sowing. I may say that the cultivator does realise the value of good seed, but it is not easily available to him. For the present the Dhárwár District Agricultural Association supplies good seed of Kumpta cotton to cultivators and I wish there were many more examples like this. Similarly I believe good results will be obtained, if seed of ordinary Kumpta cotton from favoured localities like Dhárwár or Bankápur is distributed in parts like Bijápur, where at present inferior kinds of Kumpta are grown. The method of sowing the seed should also be improved. For the present the practice followed is to put the seed through bamboo tubes attached to the tines of the harrow. This causes very uneven distribution of the seed, so that in some places in the row there are long blanks and in other places the plants are thickly crowded. This kind of crop greatly reduces the outturn. For the present in the absence of a better machine I would recommend the use of the Gujarát pattern of cotton seed drill throughout the whole of the Southern Marátha Country, by which even distribution of the seed is secured. A little extra seed can be sown with advantage and the crop can be subsequently thinned. This way the plants will stand at regular distances and greater outturn will be obtained. The effects of good tillage on crop speak for themselves.

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OUR WORK ON RICE (PAST AND PRESENT).

In our Presidency there is no tract, which claims 'Rice' as its staple crop, as 'Konkan and Mával,' and whatever work on rice the Department has done up to this time, and is doing now, relates chiefly to this tract. It is a matter to be regretted that on account of its limited staff, the Department could not undertake special work on this crop till the year 1911, when an Agricultural Station was started near Alibág, quite in the heart of the 'rice-growing' tract of Konkan. Very recently, one more station is opened at Shirgaon near Ratnágiri.

Nevertheless the Department claims some substantial work, on one important problem in the cultivation of rice, before the starting of these farms, and this is the work regarding 'Ráb.'

It is needless to mention to those who come from Konkan and Mával, what is meant by Ráb, but for the information of the others, I might just explain it. In Konkan and Mával rice is almost invariably grown by transplanting seedlings, which are grown on a seed-bed. The seed-bed is generally burnt in the hot season, by spreading on it a layer of dried cowdung or loppings of trees, which is covered over by a layer of dried leaves or grass which in its turn is covered with a thin layer of pulverized earth and the whole is set fire to. The material burnt is called 'Ráb' and the process is known as 'Rábing.'

In order to trace work on this problem, we must go back as far as 1880, when the Forest and Revenue authorities conducted some experiments in this connection. The point at dispute then was, whether 'Rábing' the seed-bed is essential for rice cultivation in these parts. These experiments proved valueless owing to the manner in which they were carried out, and the intricacy of the scheme on which they were done.

Five years after this, *i. e.*, in 1885, Mr. Ozanne, I. C. S., the then Director of Agriculture, took the problem in hand and conducted experiments at five different centres, three of them being in Mával and two in Konkan. The object of these experiments was to test the comparative value of different kinds of 'Ráb' and to determine whether any other material, less valuable than tree-loppings, could not be used instead. The results obtained from the experiments carried out by Mr. Ozanne were as under :—

- (1) 'Cowdung Ráb' is decidedly superior to all other varieties: the better the soil and season, the more is its superiority exhibited.
- (2) Plots, without 'Ráb' and unmanured, are markedly inferior, not only to the plots with Ráb, but manured plots without Ráb.
- (3) Manure unburnt is much inferior as far, at any rate, as regards the area of transplantation to manure burnt.
- (4) That good results are obtained from 'Ráb' made either from leaf or grass.

The details of these experiments have been given by Mr. Ozanne in Bulletin No. 4 of 1886 of the Department of Agriculture, Bombay, which may be read by those interested in the question.

Thus the question of the actual value of the 'Ráb-process' was set at rest and Mr. Ozanne's conclusions have never been seriously disputed since the time they were published.

Two matters, however, remained open. These were, the discovery of a good and economic substitute for the 'Ráb-process,' and the discovery of the real nature of the 'Ráb-process,' so as to lead to the discovery of a more efficient and less wasteful method of carrying it out.

In order to work out these problems, the Department opened a special experimental plot near Lonávla and a number of experiments were conducted there, on these lines till 1910 under the control of Professor J. B. Knight. These experiments were laid down to solve the following questions :—

- (a) What does the efficiency of 'Ráb' depend upon?
- (b) Can a substitute be found for 'Ráb'?
- (c) What 'Rábs' are most beneficial?
- (d) Will any after-treatment of the crop, secure the same benefit as Rábing gives?

The greatest nuisance, in the conduct of this experiment at Lonávla, was the *crab*, which damaged the seed-beds to a great extent. The seed-beds were ultimately fenced with wire netting which proved of great use. The results obtained at Lonávla show :—

- (a) That of all kinds of 'Ráb,' the cowdung Ráb is the best;
- (b) That the greater part of the beneficial effect of the Ráb treatment, may be attributed to the heating of the soil.

(c) That the effect of the ashes of Ráb material though considerable, is of minor importance, as compared with that of heating.

(d) That results, as good as those obtainable with the Ráb treatment could be obtained by manuring with some of the nitrogenous manures such as the fish manure, oil-cakes, and Sulphate of Ammonia, at the rate of 30 to 35 lbs., 70 to 75 lbs. and 12 to 15 lbs., respectively, per guntha of seed-bed, the quantity varying according to the nature of the soil.

However, people did not seem inclined to take to the use of the Ráb substitutes on the following grounds:—

1. They are required to undergo out of pocket expenditure, while Rábing can be done by manual labour only.
2. That weeds take hold of the seed-bed more in the absence of Rábing which burns all seeds of weeds.
3. That un-Rábed seed-beds are heavier for uprooting seedlings, while in Rábed seed-beds that goes easier.
4. Supply of manures, to be used as substitutes of Ráb, is below the demand and consequently would raise their prices.

With a view to solve these difficulties, as far as possible, further experiments were made and the following are the observations:—

(a) That appearance of weeds in un-Rábed seed-beds greatly depends upon its previous cultivation, they being absent in clean cultivated fields.

(b) In the case of Rábed seed-bed, the uprooting goes easier than in an un-Rábed one.

(c) If substitute manures are used to raise the seedlings, in alternate years with Rábing, weeds do not appear and also the seedlings could be lifted with sufficient ease.

Besides these some very useful and instructive laboratory experiments were made for the last three years, by Dr. Mann and Messrs. Joshi and Kaniṭkar, to find out what the 'Ráb process' owes its efficiency to. The results of these experiments are published in the Memoir of the Department of Agriculture in India, Chemical series, Vol. II, No. 3, and hence I do not wish to dilate on them here. The results so far obtained by them are not conclusive, and further work on the same lines is continued.

Let us then see, how far, all these results and observations, have a practical bearing on the practice in vogue in Rice-husbandry in Konkan and Mával.

There is a loud cry at present from all quarters about the insufficiency of the supply of Ráb material, and the question at issue is how to meet it. Everybody knows that the better the seedlings the more is the yield of rice per acre and these cannot be had without proper treatment of the seed-bed-perfect Rábing. We often hear people saying that yields of rice per acre in Konkan are going down. This deterioration might be attributed, along with other causes, to the bad preparation of seed-bed, which is brought about by the inadequate supply of Ráb material.

There are two kinds of Ráb materials, cowdung and loppings of trees, grass being required in both the cases. The supply of the latter (tree-loppings) has gone down very much in certain localities, owing to the denudation of the Forest and Malki numbers, and naturally people are driven to find out some suitable substitute for 'Ráb.' The chances, therefore, are that unless some serious steps are taken towards increasing the supply of Ráb material, people will be compelled in the near future to take to the use of Ráb substitutes experimentally declared useful by our Department.

We shall now discuss the comparative values of the different Ráb materials and their substitutes and side by side see how far we are in a position to increase the supply of each of them.

Cowdung.—This is by far the most important Ráb material and Ráb made with this is decidedly superior to that from any other material. One pair of animals gives in a year, dung sufficient for burning approximately three gunthas of seed-bed. At an average, six gunthas of seed-bed is required to be prepared, to raise seedlings sufficient for one acre, and to get the requisite quantity of cowdung for this much seed-bed a cultivator must have at least two pairs of animals. Taking into consideration the Kolába district, for instance, the typical rice producing tract, there are 253,694 acres under rice, while there are only 323,491 cattle in that district; so the ratio comes to 1: 1.27 *i. e.*, 1.27 cattle per acre. According to the calculations made above, two pairs of animals are required, to have cowdung sufficient for the seed-bed for one acre; while we have got only 1.27 animals per acre. This deficiency of cowdung, has, so long, been made up by Tahál (tree-loppings) but this material also is falling short of the demand. It seems well-nigh impossible to increase the supply of cowdung, which is only 50 per cent. of the demand, to any

appreciable extent; so either the supply of Tahál must be increased or one of the substitute manures such as fish manure, oil-cakes, Sulphate of Ammonia, must be used in alternate years with cowdung Ráb, as this practice secures most of the advantages of Ráb.

It is a matter of pleasure that in some quarters people have already begun to think about this problem and have actually commenced work to increase the supply of Tahál, by following Tahál cutting regulations of the Hon'ble Mr. Orr, formerly Collector of Thána, whereas in other quarters they seem to have thought little of the impending evil that is likely to befall if no steps are taken to remedy it. The work of increasing the supply of Tahál is more of a co-operative nature than an individual one and is of such a kind that Agricultural Associations can easily undertake it.

It would not be out of place here to suggest the lines by which the supply of Tahál can be increased. Villages having pretty large warkas numbers, should engage the services of a watchman, who should enforce every one in that village to cut Tahál according to the Tahál-cutting regulations. Defaulters should be punished by the village communities. In the rains, the watchman should sow the seeds and plant cuttings wherever there is room for some years, the supply of Tahál is sure to be increased to the requisite quantity. What is most needed is co-operation and wherever people are ignorant, the Agricultural Associations through their members should explain and advise the people and get it done by them.

Side by side with the attempt to increase the supply of Tahál, the question of increasing the supply of some of the substitute manures must not be lost sight of. The supply of Karanj and Undi cakes can be very easily increased by increasing particularly the plantation of these trees and this can be done without extra care. If every cultivator makes it a point to plant even one tree every year in his holding, he will be serving himself and his village to a considerable extent. Castor cake is another substitute manure and the cultivation of castor after rice can be profitably increased in Konkan in suitable localities wherever, due to the nuisance of stray cattle, wál cannot be grown.

The cultivation of the groundnut crop on the warkas lands in Konkan, is another source of getting Ráb substitute manure, namely, the groundnut cake.

These are, in short, some of the ways by which the deficiency of cowdung for Ráb can be made up.

Problems suggested to our minds at the present stage, some regarding the further possible improvements in rice cultivation, and others having an indirect bearing on the Ráb question, are under investigation at the new farm at Alibág and I propose to describe them in a few words.

It is often heard even from experienced cultivators that the fertility of rice lands in Konkan is going down. Amongst other causes such as the imperfect cultivation, want of due repair to bándhs, weak seedlings, and unfavourable seasons, this fact might be attributed partly to the practice of taking the same crop year after year in the same field and also partly to the absence of the practice of manuring rice fields. Fields situated in valleys and at the foot of hills get the natural advantage of the wash from the forest, but such areas are limited. In certain tálukas rice fields are sheep folded, but this is done only by well-to-do cultivators. As a rule an average Konkani cultivator does not manure his rice fields, all the available manure being utilised for the seed-bed.

Experiments with a view to find out a cheap manure both for keeping up the fertility of rice fields and steadily increasing their yields per acre, are laid down. Of all the manures, Green manure is the cheapest and most useful for rice and is such that even a poor cultivator can use it, without undergoing out of pocket expenditure.

It will not be out of place here to make a short explanatory note on the term '*Green manure*.' It is a manure made out of a crop having quick growth and full foliage by rolling it down or ploughing it in when succulent, to become rotted in the field, as this rotting ultimately turns the green organic matter into humus. A leguminous plant is generally preferred as it happily combines in itself all the above mentioned qualities and, the nitrifying faculty to boot.

A leguminous crop would germinate and grow fast, even under the heavy rains of Konkan, and in water-logged conditions, would alone suit the Konkani requirements. Rice is sown on seed-beds in June and takes from 21 to 35 days to be ready for transplanting. The rice fields are vacant during this period. A '*Green manuring*' crop sown at the first shower in June in these fields, attaining a sufficiently tall growth before the time of transplantation of rice, would make a beautiful '*Green manure*' to be trampled down at the time of puddling.

Two crops San or Tag (*Crotalaria Juncia*) and Dhaincha locally known as Dherdi (*Sesbania Acculiata*) are being tried for *Green-manure* on the Alibág Farm. San is a quick growing plant and grows to a height of about two feet in a month on lighter description of soils, by sowing it at the first showers. On heavy clay soils like those of Alibág, it has failed to grow so far; on the other hand when it was sown in the Ráb season after rice, it

grew to a height of three and a half feet and yielded 4,540 lbs. of green matter per acre. The increase in the yield of rice per acre due to the addition of 'San Green manure' in this way will be recorded after the harvest of the present rice crop, but at the present stage the crop is showing better growth.

In Mával at Wadgaon an experiment with San, as a 'Green manure' for rice was tried by Mr. P. C. Patil, L. Ag., Divisional Inspector of Agriculture, Central Division, by sowing the crop in June at the first monsoon showers, and it yielded 30,000 lbs. of green matter in one month's growth and increased the paddy crop by 1,913 lbs. per acre.

It will be a good plan on the part of Konkan Agricultural Associations, to try to grow San as a Green manure crop in the Kharif season on well drained and lighter description of soils and in the Rabi season on heavy clay rice lands, and report results to compare with those obtained by the Department.

Dhaincha or Dherdi is a very slow growing plant to start with and has been found to be unsuited for growing as a Kharif Green manure crop for rice. It has however fared well by growing in the Rabi season after rice. The increase in the yield of rice per acre due to this manure by growing it in the Rabi season and rolling it down on the land will be available at the end of this season.

Both Dhaincha and San gave very bumper crops, for Green manure, by sowing them in the months of April and May respectively, under irrigation. In July when they were uprooted and ploughed in they had reached the height of 8 feet and 5 feet respectively. This shows that wherever irrigation facilities occur as in the Ratnágiri and Kánara districts, it can be adopted with great advantage.

The results and observations made so far in connection with the Green manuring of rice show that it does not seem probable that a particular system of Green manuring, equally applicable to all the districts in Konkan can be recommended.

Conditions in the South Konkan are more favourable for growing Green manure crop under irrigation. In North Konkan and Mával it seems that Kharif or Rabi Green manuring method will have to be adopted. It is hoped that we shall be in a position to give out conclusive results on this problem before the next Agricultural Conference.

Manuring of rice with the local manures in Konkan is another point of investigation, and although tangible results are not obtained still it has been found that of all the manures, fish manure is the best. An application of 360 lbs. of fish manure valued at Rs. 15 per acre has given an average increase of 650 lbs. in the yield or 33 per cent. more over the no-manure plot, valued at Rs. 19-10, leaving a net profit of Rs. 5 per acre. On poorer lands the same application increased the outturn by 890 lbs. of paddy per acre valued at Rs. 26-9, leaving a net profit of Rs. 12 per acre. Along the coast in Konkan, it is recommended to use this manure with advantage. Other manures under trial are oilcakes, mhowra-refuse, rice hulls, urine earth, poudrette and bone-meal.

In Konkan it is a practice to transplant from 15 to 30 seedlings per hole thereby requiring larger area under seed-bed per acre. With a view to see whether this large number of seedlings cannot be reduced with advantage, and if so to what extent, experiments are laid down. Although conclusive results are not obtained on this point still it has been found that if sturdy seedlings are produced by thin sowing and under best preparation of seed-bed from 3 to 4 seedlings per hole would give better results. If this proves successful about 30 per cent. of the area under seed-bed can be reduced which would consequently help the solution of the Ráb problem to some extent.

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SPRAYING OF PLANTS.

There are so many fungus diseases and insect pests which do serious injury to cultivated crops that the farmer or fruit-grower is often disappointed by the partial or total failure of his crop. It is by no means that the evil is unavoidable. Various means have been devised which check these diseases and pests. Spraying is one of them. It is not the aim of this short note to give the methods and formulæ for spraying. It is merely to show that spraying is a necessity: it insures a good crop: it does pay in the end. That successful spraying is no longer an experiment but an accomplished fact is borne out by my experience of the last four years.

The grape-vine is extensively cultivated round about Násik, so much so that the area under grape plantation is more than 350 acres. The fruit finds a ready market in Bombay, and is even exported up country as far as Cawnpore and Delhi.

There are many fungus diseases which seriously attack the grape-vine. Round about Násik a fungus known as powdery mildew is one of them which does considerable harm, making the chances of a good crop very uncertain. This mildew is locally known as *bhurs* and in appearance is a white powder like flour. After the October pruning, when the ripe buds become active and put forth new growth, the mildew makes its appearance first on the under surface of leaves and on young shoots. It gradually spreads and attacks the fruit. The fungus steals its food from the body of the plant, its leaves, young shoots and fruit, permanently injuring the tissues attacked. The fruit ceases to grow and will not ripen. It is often shrivelled up; the berries are cracked and the seed exposed. When once the fungus makes its appearance it rapidly spreads from vine to vine and the crop is ruined totally or almost so.

I have been interested in grape-growing for the last 16 years and until recently my crops suffered more or less: they were totally destroyed many times: and very seldom I had a full crop. All grape growers shared the same fate and the prospects of a good crop depended greatly on mere chance.

Such were the circumstances till 1908 when I was sent to Poona to attend a demonstration on grape-growing and grape plantation. It was very interesting and instructing also. When it was over I enquired if there were any remedy against the vine-mildew. Mr. W. Burns, Economic Botanist, Agricultural College, Poona, promised to think over the matter. Subsequently he wrote to me that he was prepared to undertake certain experiments to check mildew at Násik, provided he could have the use of some plantation or a few vines at least. My beloved brother, the late Ráo Báhádúr N. V. Gole, accepted the proposal and allowed us to treat 100 vines only in one of his plantations.

First year's experiments.—Before pruning, the vines were found badly mildewed and presented a sickly appearance. In other plantations the vines were observed to have suffered similarly. The vines of our experiment were carefully pruned and old bark was removed. They were then sprayed with Bordeaux mixture.

(Take—

Copper sulphate	...	...	...	...	...	12 lbs.
Slaked lime (fresh)	...	...	...	...	...	8 lbs.
Water	...	...	...	...	...	100 gallons.

This is called normal Bordeaux mixture.)

The vines in the plantation which were pruned a little earlier had started new growth. Between October 15th and December 31st, 1909, the 100 vines were sprayed five times with the Bordeaux mixture or the mixture slightly diluted. The result was very satisfactory. The fruit in the sprayed portion presented a healthy appearance while the fruit in the unsprayed portion did in no way stand comparison with the fruit on the sprayed vines of our experiment. The vines in the unsprayed portion were badly mildewed. Mildew was also slightly present in the sprayed portion; but it was held in check and failed to injure the fruit appreciably. Other plantations suffered similarly from the pest and a few escaped by chance. As many as five sprayings had left stains of copper-sulphate on the fruit; and growers and middlemen condemned the use of a copper salt and had grave fears as to the poisonous effects of the fruit so treated. I myself was afraid that the copper salt would accumulate in the soil and would prove harmful by repeated sprayings or possibly would kill my vines. Mr. Burns and Mr. G. B. Patwardhan, his assistant, who carried on these experiments, visited the plantation many times and were keenly watching the results. I spoke to them about the fears entertained by the growers as also about my own objection. Dr. H. Mann also once visited the plantation to see the results. Fruit from the sprayed vines was submitted to him for a careful analysis. It showed that though copper was present it was in such small quantity that it was innocuous. A man may safely eat 25 lbs. of such fruit in a single day without any fear of poisoning himself, but he would probably feel the effects of excess of grapes before that of copper salt began to trouble him. To my inquiry as to the probability of any injurious effect upon the constitution of the soils of vineyards, Mr. Burns referred me to Lodeman's 'Spraying of plants' which states that it would need at least 1,100 years' continuous spraying to cause any effect on the soil.

Second year's experiments.—The somewhat satisfactory results of the first year encouraged and induced my brother to give the method of treatment a fair trial on a large scale and he placed his two plantations of 3,000 vines under my care. I offered to undertake the experiments: my offer was accepted but Mr. Burns reserved 400 vines for treatment under his personal directions. The season of 1910 was very abnormal, the rainfall exceeding the average by some three inches of rain. As was to be expected the humid condition of the weather was more favourable to the growth and spread of mildew. All vineyards round about Násik were attacked by mildew and ultimately the crop was greatly damaged by it. Some plantations withstood the attack for some time but by the beginning of January 1911 they too succumbed and by the end of the month the whole crop of the year was severely damaged by mildew. Not so with my plantations. They were fully protected by three to five sprayings of Bordeaux mixture with soap and till the beginning of February 1911 mildew failed to injure the crop. Unfortunately the crop was wholly destroyed by another cause—I mean the severe frost of 2nd February 1911—and thus the opportunity of proving to a conclusive demonstration the preventive value of Bordeaux mixture was put off and another year lost. Nevertheless it was clear that by the end of January 1911 unsprayed plantations, with a few exceptions, were badly mildewed and more than 75 per cent. of the crop was lost. In my sprayed plantations mildew, though it did make its appearance and it was sporadic, was held in check by the preventive effects of Bordeaux mixture. I am sure that the few plantations that escaped would have suffered later on.

Third year's experiments.—In the season of 1911-12 the same treatment was followed. Bordeaux mixture with soft soap was used. Soap has no fungicidal value; it was used merely for its adhesive property. The crop in our two plantations was fully protected and saved by three or more sprayings, while the fruit in unsprayed plantations was badly mildewed and 40 to 50 per cent. of the crop was lost.

The season of 1912-13.—The results of the last three years were so satisfactory that Mr. Burns discontinued further experimental work in this direction. That the above results conclusively demonstrated the usefulness of the treatment may be gathered from the fact that many grape-growers and middlemen, who were sceptics in the beginning and objected to this new method, voluntarily adopted it and were busy spraying their vineyards during this season. Many had the satisfaction of saving their crops by this preventive method. Of course, there were some failures. This was due to a lack of thorough knowledge and to the half-hearted way in which the spraying was done. When to spray and how to spray are questions of detail and some experience. But then to obtain the best results the spraying must be done thoroughly. I have so far shown that it is necessary to spray a grape-vine plantation to insure a good crop. According to my experience three sprayings are quite sufficient—1st normal, 2nd 50 per cent. normal and 3rd 50 to 30 per cent. normal. The expenses of such three sprayings come very nearly to Rs. 20 per acre (700 vines). The average value of a good grape-crop on one acre is between Rs. 300 and Rs. 400; when the vines are not sprayed the chances are that 50 per cent. or 100 per cent. of the crop will be lost. But by the expenditure of a small sum of Rs. 20 per acre the crop will be saved and will make a vast difference in the earnings of the grower which exceed 5 to 10 times the cost.

All crops are subject to the ravages of fungus diseases and insect pests. For instance, the potato, the Suntra orange and other citrus plants are susceptible to them. Bordeaux mixture is a good fungicide: its value is chiefly preventive. There are other materials and formulæ for spraying. The cultivators and fruit-growers of European and American countries have fully realized the fact and it has almost become a maxim with them that—

“Spraying is a necessity: it insures a good crop: it does pay in the end.”

I have found that the professors and lecturers of the Agricultural College at Poona are always willing and ready to solve my little difficulties and give me their best advice. Individual efforts can but do little. An opportunity was offered and accepted. Patiently Mr. Burns and Mr. Patwardhan worked for three years to prove the usefulness of a new method, and the value of their efforts is great. They have conferred a boon on the grape-growers of this district, at any rate; and the community in general has also profited, inasmuch as they will get increased supply of good fruit. I am confident that if well-to-do and interested persons will approach the Agricultural Department in a spirit of hearty co-operation much good to the community will result.

Those who wish to have more detailed information about the experiments in the treatment of grape-vine mildew may refer to Bulletins No. 36 of 1910, No. 45 of 1911 and No. 51 of 1912, published by the Department of Agriculture, Bombay.

Násik, 20th August 1913.

H. V. GOLE.

THE ESTABLISHMENT OF COTTON MARKETS IN EGYPT.

Lord KITCHENER has done much for agriculture in Egypt, but one of the most useful measures for the benefit of the cultivator which he has introduced is the establishment of cotton markets. This paper gives a brief account of the management of these markets with a view to induce Municipalities and District Local Boards in this Presidency to follow the example of Egypt. The control and financing of the markets is in the hands of Municipal or Provincial Councils according to their location. The market consists of a space of about one acre enclosed by a wooden fence which costs about Rs. 770 to make. Within it a wooden shed with two or three compartments is erected to accommodate the Market Superintendent or other employees: this costs from Rs. 310 to 460. In the centre of the market stands the official weighing machine with post and cover complete, costing about Rs. 150, and by its side is a shed about 60 feet long by 35 feet wide, for protection against sun and rain. In a conspicuous position near the entrance and facing inwards is erected a large signboard on which is marked up daily with large enamelled tin figures, like those used for the score at a cricket match, the opening price of cotton on the Alexandria Exchange together with the previous day's price for purposes of comparison. Should the price rise or fall more than about 12 annas in the course of the morning a further telegram is sent from Alexandria and posted up in a separate line thus:—

.....Yesterday's price of cotton.
To-day's opening price of cotton.
Alterations in price.

The prices are official and the Telegraph Department render a monthly account for the telegrams.

Besides, a circular is despatched every afternoon from the headquarters of the National Bank, giving the day's prices for every grade of cotton, cotton seed and of contracts. For this the Bank is paid Rs. 92-4-0 a month by Government. In this way the cultivator has accurate information as to the latest prices and is not dependent on the buyer who is often unscrupulous.

The staff is composed of—

- A Market Superintendent on from about Rs. 75 to 95 a month for 6 months.
- A door-keeper on about Rs. 46 a month for six months.
- One watchman on about Rs. 17 do. do.
- One watchman on about Rs. 17 a month for 12 months.

At markets receiving about 30,000 lbs. of cotton a day an official weigher on about Rs. 62 a month for 6 months is engaged; at smaller markets the Superintendent acts as weigher. The cultivator can have his cotton weighed direct on the official machine or verify weights recorded by public weighers who are allowed to charge from 2½ to 4½ annas and work in the market. In addition to public weighers, cotton experts are allowed to work in the market. The entrance fees charged are 1½ annas a cantar = practically 100 lbs. and ½ anna for every additional half cantar, and no charge is made for weighing on the official machine. The money is collected at the door by the door-keeper, who judges by the size of the sack what fees to collect, as nearly all cotton is brought in large sacks weighing about 1½ cantars. A demurrage charge is levied in busy markets for cotton left there, at the rate of half an anna for 24 hours in the case of merchants after purchase or for 48 hours after entrance in the case of the cultivator.

Small stores and offices are erected in many markets for the use of merchants. They are not allowed to project more than 23 feet from the fence along which they are built. The Council either erects the stores and charges about Rs. 154 for the season for each one measuring 23 x 16 feet, or lets the space at from 6½ annas to Rs. 1-6½ per area of 10½ sq. feet.

Some of the markets are being used for distribution of cotton seed on behalf of the Agricultural Department and a commission of 6½ annas per 5½ bushels is paid to the Council. The Khedivial Agricultural Society use the markets as agents for the sale of their chemical manures, for which the Council gets a commission of about 5 annas 8 pies on every bag sold.

An inquiry has been made recently by the Department in many of the cotton centres of this Presidency as to the system by which the cultivators market their cotton and it has been found to be most unsatisfactory. The crop is either sold before it is picked, generally to great disadvantage, or it is brought to Bunyas in the bazaar with or without the intervention of a middleman. The weighments are reported to be dishonestly made in many cases, and owing to his ignorance and illiteracy the cultivator is deceived as to the real market rates. The laxity allowed in the use of weights and measures in India and the consequent loophole for all kinds of trickery have been a source of amazement to me, ever since I investigated the subject many years ago, and I am astonished that the Agricultural community have endured these abuses so long. The only district where any attempt has been made to stop them is, as far as I am aware, East Khândesh.

I have appended an estimate of the capital expenditure, annual maintenance charges, and income derivable from the establishment of a cotton market in a town where the daily delivery for 5 months may be expected to be 50,000 lbs. per diem. I have estimated the charge for entrance into the market at a quarter of that levied in Egypt, but the profit would be very fair.

W. W. SMART,
 Acting Director of Agriculture.

Estimate of Expenditure for Establishment of a Cotton Market.

Details.	Amount.		
	Rs.	a.	p.
<i>Capital expenditure</i>			3,800 0 0
Barbed wire fencing for one acre	150	0	0
Shed with three compartments brick 16' x 12'...	900	0	0
Weighing machine	150	0	0
Shelter 60' x 35'	600	0	0
Construction of godowns with two compartments 20' x 25'...	2,000	0	0
	3,800	0	0
<i>Annual expenditure</i>			946 0 0
Depreciation on building @ 2 per cent	75	0	0
Interest on capital @ 4 per cent.	152	0	0
	228	0	0
<i>Staff—</i>			
Superintendent on Rs. 40 for 5 months	200	0	0
Door-keeper on Rs. 15 do.	75	0	0
Watchman on Rs. 12 do.	60	0	0
Watchman on Rs. 9 for 12 months	108	0	0
Weigher on Rs. 30 for 5 months	150	0	0
	593	0	0
<i>Contingencies—</i>			
Telegram charges at 8 annas a day for 150 days	75	0	0
Miscellaneous	50	0	0
	125	0	0
Grand total			4,746 0 0
<i>Estimated income.</i>			
For markets dealing with 50,000 lbs. per day—			
Charge at $\frac{1}{2}$ anna per 100 lbs.	1,172	0	0
Rent of godowns	300	0	0
Total			1,472 0 0
Net profit			526 0 0

THE SYSTEM OF COTTON SEED DISTRIBUTION IN BERAR.

(Contributed by the Director of Agriculture, Central Provinces.)

Passing over the early attempts at the introduction of pure seed inaugurated by the Cotton Commission, cotton seed distribution in these Provinces on systematic lines dates from the year 1903-1904, when the Government placed funds at the disposal of the Agricultural Department for the purposes of supplying good seed to cotton growers. At that time, as now, the long staple cotton problem was well to the front; but at that time the difference in price between that of a long staple, such as was available in the Central Provinces and the shorter stapled Jari cotton, was more marked. To encourage and spread the cultivation of longer staple cottons the department made an attempt to distribute the seed of Bani (*Gossypium Indicum*), then commonly grown in a fairly pure condition in Southern Berar, in those areas in which the local Jari was commonest, trusting that the better-price offered would induce cultivators to take up this cotton in place of the shorter staple and more prolific mixture called Jari. The best Bani crops available were selected and the seed, to the extent of several thousands of pounds, distributed on trial. The attempt was a failure. It appears to have been devised without due consideration of the cultivators' real interest. This new cotton gave but a poor outturn, and at the same time the price of the short staple began to rise steadily, thus removing the slight advantage the long staple first had. At the same time the Agricultural Department at that date was scarcely developed and the staff too weak to control successfully the distribution and watch its results.

In 1905, three seed farms were started in Berar and two in the Central Provinces at Nagpur and Akola. These were started on the understanding that Government supplied the selected seed gratis and would make good any loss which might arise from the growing of this seed. No loss arose and hence no compensation was called for.

The object of these early seed farms was the propagation of selected seed, Bani and Jari, for distribution among cultivators. For, though the distribution of Bani in the Jari growing districts had failed, there was still a demand for reliable Bani in the Southern portions of Berar and other areas where the variety was still popular. The fall of Bani prices and the rise of those offered for Jari still continued. In 1906, Bani kapas sold at Rs. 10 per khandi (560 lbs.) more than Jari; at the present time Bani fetches 10 to 12 less per khandi than Jari. The change in prices and the lower yield and lint percentage of Bani are responsible for the almost complete neglect of the indigenous long staple cotton of these Provinces, and for the fact that at the present time and of recent years the energies of the Agricultural Department have been directed towards increasing the money returns of the Jari cotton, though, as noted later, where there existed opportunities for the economic growth of a long staple cotton, the department has attempted the furtherance of an introduced long staple variety termed Buri. In June 1906, the Akola Farm was started, and with its commencement dates the first really organized attempt to improve cotton production, from the cultivator's standpoint. The first work undertaken was a thorough examination of the local varieties and the separation of the local Jari into four distinct types, and their further trial and comparison and the trial and testing of types derived from other Indian sources.

As a result of the latter work Buri was found to be more suitable than the long staple Bani and gradually replaced it on the seed farms. It gave a better outturn and was at the same time found to be less susceptible to cotton wilt. For some 3 years there was a ready sale of this variety from the existing seed farms, till in 1911 as much as 5,000 acres were under this crop. Since that date short later rains have hindered its further progress, as it is only at its best if rainfall is ample, and at the same time the early prices have not been maintained. The segregation of the local Jari into types, as mentioned, resulted in the isolation of 4 distinct forms. One of these Rosea (*Gossypium neglectum*) stood out as being distinctly the most prolific and in possessing a higher lint percentage, and, as prices now stand, infinitely more paying to the cultivator than either of the other three or the mixed Jari.

The chief work of the department's efforts in connection with cotton has therefore been centred on the improvement of the yield of this type and the pushing of Rosea as a substitute for Jari in the cotton areas of the Central Provinces and Berar, so that next season it is anticipated that we shall have enough seed grown under control to sow over 300,000 acres of this type.

The methods adopted are as follows :—

The Government Farm, Akola, is the centre of the cotton work and the source of all seed which eventually finds its way to the private seed farms, cotton growing unions, and finally the general public. Here plant to plant selection of Rosea is carried on, the produce of likely plants is tested in line growths, the best of this in larger plots, and the best is propagated first on a section of the farm and finally on the 200 acres of rich land which comprises its cotton growing area. This seed is all ginned on the farm by its own plant. Thus seed from a single plant covers the farm in its fourth year and goes out

to the private seed farms in the fifth year. Seed farms are selected as follows. A promising grower of good repute in a locality surrounded by villages is invited to start a seed farm. In the early stages the seed was given gratis; now we find dozens willing to become seed farmers under our conditions and to pay for the seed they grow at 16 lbs. per rupee. If a man accepts the suggestion some 10—50 acres of his land are selected and he undertakes to sow our seed on this area and to follow out the instructions below, including the roguing out of any foreign plants, of which a small percentage may be present. This farm is put under the charge of the Agricultural Assistant of the district who sees that the rules are maintained.

Ginning of cotton grown on private seed farms is generally done by special arrangement at local gins, but as even with the very best precautions this is attended with the risk of possible admixtures many of the seed farmers, who not only grow Rosea on the special seed farm area, but now have the whole of their cotton land under this crop, are investing in plants of 2—4 gins driven by an oil-engine, a desirable condition which will rapidly increase with the establishment of Rosea cotton-unions, the latest development of the pure seed supply. To encourage this the Agricultural Department keeps two men trained in the working of the oil-engine and machinery, whose duty it is to visit these private engines from time to time and make any repairs or adjustments, free of cost.

The disposal of the produce of the seed farm is or has been till this year, entirely in the hands of the grower, who disposed of the lint and sold the seed in his neighbourhood often realizing 2 or 3 times the usual price of Jari cotton seed. This year the department, finding that with sale from seed farms the increase of the area under Rosea was too slow a process, and that, though the Rosea seed was readily bought up and used it largely found its way to the factory and not to further use as seed, has begun to develop round the best seed farms, at places where the surrounding growers are willing, cotton seed unions. For these, the seed comes from the local seed farm or from some other seed farm where it is available. These unions consist of from 8—20 growers, who undertake to only grow Rosea and no other cotton, to employ a Kamdar, to rogue out any inferior plants and specially gin their seed, keeping it for seed purposes. Each union elects a President, Secretary and one or two supervisors whose duty it is to see that members maintain their crop in pure condition and follow the rules of the union.

Cotton unions are, however, only in their infancy: this is their first year and some 27 have been formed. The general indication is that, though two or three may be failures, the majority will be successful, and by their aid the extension of Rosea or any other better variety later will be rapid.

The following shows the increase of cotton seed farms from year to year:—

Year.	Number.	Remarks.
1904-05	5	
1905-06	5	
1906-07	6	
1907-08	6	
1908-09	8	
1909-10	21	This year marks the first of Rosea.
1910-11	36	
1911-12	90	
1912-13	65	The decrease this year is due to the formation of the unions above, in which in several cases 2 or 3 old seed farms in one locality are combined. Actually there are over 400 seed growers cultivating 14,145 acres.

The annual conference at Akola gives an opportunity for the seed farmers to meet, study the varieties and experiments in evidence, and discuss the future extension and management of the work. At the last annual meeting 2,000 cotton growers attended.

COTTON SEED FARMS IN BERAR.

INSTRUCTIONS TO FARMERS (TRANSLATION OF VERNACULAR PAMPHLET).

General Object of these Farms.

Pure Rosea cotton seed is grown at Akola. Rosea is one of the types of *Jari* which has been proved to be more profitable than the usual mixture. The Akola farm cannot of course grow sufficient cotton for the whole of Berar. It is thus desirable to obtain the assistance of private growers, who are capable of seeing the merit of a pure seed supply, and of farming their cotton in an efficient manner and of keeping it free of mixture. On a certain selected area of their farm, to be termed the seed farm, such men will undertake to grow seed from Akola. This seed they will sell to their neighbouring cultivators at whatever price they can get. As the value of this seed is well above that of ordinary *Jari*, it will be found that such men who are selected as seed farmers will make a handsome profit off their seed farm area. The following are the conditions under which a man will be selected as a seed farmer and the instructions which he will undertake to follow:—

- (1) The area selected for a seed farm shall not be less than 10 acres or more than 50.
- (2) The cultivation given shall be of the best and under the direct supervision of the owner. Provided that cotton is manured, a selected area may be grown year after year, with cotton. If a rotation is desirable, Juar may be substituted for cotton. Under these conditions, the seed farm area should consist of two equal portions alternately under cotton and Juar.
- (3) In selecting the area for a new seed farm, an area which last year was sown with *Jari* should be avoided. The best land available should be selected.
- (4) Poudrette generally speaking is the best manure, otherwise well rotted cow-dung should be used. It should be well rotted to reduce the chances of its containing cotton seed which may be fit to germinate. Any field manured with cow-dung requires special attention at the time of growth to eradicate inferior types, introduced in the manure.
- (5) Selected seed of the variety sown must be ordered annually from Akola, which will supply such seed to seed farms in the first place.
- (6) The Akola seed is pure. The seed farmer should take the greatest care to prevent any mixture before sowing or after the crop is harvested. For this reason in any one field only the selected cotton seed must be sown. If there is not enough seed to sow the whole, the rest of the field must be put down in *Tur* or *Juar*.
- (7) Any mixture noted in the field as the crop develops must be uprooted.
- (8) At the time of picking, special precaution must be adopted to prevent mixture. Cotton seed of which there is any suspicion of mixture should be kept apart. Cotton seed from the early pickings and which is undamaged by rain should be reserved as first quality seed. Seed which has been exposed to possible damage by rain is at times however quite useful for sowing and may be reserved but not mixed with the first quality seed. The cotton of the last pickings is inferior and not useful for seed purposes, hence there is no objection to its mixture with the ordinary farm *Kepas*, after its weight has been taken.
- (9) Seed from Cotton ginned by hand gins is superior to that ginned by machines. If possible this method of ginning should be adopted. If this is not possible mechanical gins must be employed. Before beginning the ginning of any lot, the gin and the place it is in must be properly cleaned. Not a single seed of cotton previously ginned on the machine should be visible. The help of the local Agricultural Assistant should be enlisted to render assistance, if any difficulty arises.
- (10) Admixture is highly probable, if ginning is done at factory gins. To avoid this it is better to have a private gin. With this consideration in view, the Government has arranged to grant Takavi loans to seed farmers, in order to enable them to purchase their own gins and oil engines. Those who desire to do so should apply through the Divisional Superintendent of Agriculture, Akola.

NOTE ON AGRICULTURAL ASSOCIATIONS.

An American statesman is once said to have summed up the needs of an agriculturist and of an Agricultural country by the formula "Better farming, Better business, Better living". Better farming is the application of modern science to the practice of farming. Better business is the application of co-operation and modern commercial methods to the business of the farming industry. And better living is the building up in rural communities of a simple but attractive village-life without any townward tendency and all the evils, social and economical, it brings in its train. In this threefold basis for the welfare of the farmer, it is the function of Agricultural Associations to take up their due share in the dissemination of the knowledge of better farming, leaving the other factors to the care of such agencies as Co-operative Societies.

2. Two obvious questions that suggest themselves at the outset are: (i) can these Associations have any scope for useful work while Government is working through its staff, practically on the same lines as these local bodies would work, viz., by means of demonstrations, lectures, leaflets, etc.; and (ii) if there be any scope at all, what should be the organisation, constitution or equipment of such bodies to enable them to supplement the efforts of the Department in carrying home to the cultivator the knowledge of improved methods.

3. As regards the first question, I feel that with our vast population, its varying local conditions and with an illiterate peasantry, too distrustful of new methods, and too poor to try new ones individually, independent private agencies like Associations, if properly conducted, have immense field to help Government and prove themselves useful links between the Department and the farmer. And this for two reasons: Firstly, the Departmental staff cannot be adequate for so vast and scattered a population; and secondly, it cannot have the same facilities in quickly grasping the prejudices underlying traditional methods, or grafting new ideas on the old ones. For instance, one District Agriculture Overseer, whom I believe the Department at present maintains for each District, cannot possibly visit constantly the numerous villages of the District so as to effectively initiate or demonstrate the commonest agricultural reforms. Even supposing the Department can influence the individual cultivator, there is a great educative value in co-operation, and that is perhaps why in Ireland, France, or Japan a regular network of Associations is fostered or subsidised by the State. The Board of Agriculture in India, Pusa, have also accepted this view about the necessity of Associations.

4. But assuming that Associations can serve a useful purpose, are Associations as at present constituted and with their present resources likely to be of real benefit to the country, or of any help to the State? These Associations, like its sister bodies the Co-operative Societies, are of recent growth in the country, (although Poona claims to have had an Association so far back as 1885), and it is time to consider the question of their value, their inherent difficulties, their organisation, and the necessity of remodelling them.

5. I propose briefly to allude to the condition and the working of the common type of existing associations in the Deccan, and give a short account of the results of similar bodies in the other Presidencies before I venture to suggest a rough outline of the changes which I feel are necessary.

6. There are at present about 50 Agricultural Associations in the Presidency, all of them being voluntary bodies, receiving, no doubt, valuable help and guidance from the Agricultural Department, but no money grant, nor being subject to any inspection or supervision. In the majority of cases, they owe their inception to the efforts of some individual taking keen interest in agricultural improvements, and very often the sum total of the activities of the Association is the sum total of the activities of that individual. Their financial position, which at best is barely fair on the day of inauguration (generally contrived to be spectacular) dwindles down as years wear on, to one of helplessness or inertia, depending solely as it does on the generosity of a few willing or unwilling members. The personnel of the working Committee very often is composed of men who have to struggle more for their avocation than for the field; the programme of work, which is neither sustained nor regular, is more discursive than definite. As for the equipment, associations have rarely their own plots of land, much less any set of implements. I own there are a few admirable exceptions, like the Dhárwár, or Kolába or Sangamner Associations who have shown sustained and substantial work. But the bulk of them commence with and suffer from a lack of funds and, perhaps, consequently from the bane of lack of sustained interest. The only gratifying feature in the majority of cases is that there is the spirit of co-operation, though not on a business-like foundation, and as remarked by the Director of Agriculture in his last Annual Report: "I am only surprised so much money and such energy, occasional it is true, have been forthcoming".

7. Turning to the condition of such local bodies in the other Provinces of India, I should like to quote, very briefly, from the opinions recorded on this point by the Directors of Agriculture of the different Provinces in 1911, and the Report thereon by an influential Committee of the Board of Agriculture.

The Director of Agriculture, Madras, writes :—

“The history of Agricultural Associations in the Madras Presidency has been a record of failure. A movement directed from above, for the formation of associations commenced about six years ago Reviewing the history of last five years it becomes clear that the formation of these was premature and founded on several misconceptions. It was premature, because there was no spontaneous demand for them, and the work of experiment, which must precede all recommendations had hardly been begun. The radical error was in assuming that Government Officers, lawyers and journalists could advise practical agriculturists in their own profession.”

Having thus put his finger on the weak spot, the Director proceeds: “Where business-like private individuals can be found as at Kumbhakonum, they may be encouraged to form small local associations. As soon as an association is formed, it should apply to the Deputy Director of the Division for help and advice. As a rule he will be able to send one of his subordinates or go himself and hold a meeting, at which a definite programme of work for the ensuing season can be discussed. A similar meeting can be held at the end of the season, when each of the members can describe the results of his own experiments. No subscriptions will be required, and the admission to membership should be rigidly restricted so that it should not be regarded as a privilege. If these associations work, they should form very valuable links between the Department and the cultivator.”

8. In the Central Provinces, where Associations (or rather Agricultural Committees as they really are) are recognised to be a great success, the following is the state of things:—

“The Associations are bodies composed of nominees, limited in number, of the District Officers for each District. They, say, for instance, thirty in number, are called to a convenient centre, appoint a Secretary, and are met by a senior Officer of the Agricultural Department, usually the Deputy Director, who has a number of pieces of work suitable for the district ready to suggest for the members to take up. Each man with his duties allotted returns home; he is supplied at once with the material he needs, and thereafter is visited by an assistant once a month, and by the Superintendent of the Farm in the Circle several times a year. Six months later all the members meet again; the Deputy Director again is present, the work done is discussed, and a new lot of work is arranged for the ensuing period.”

9. In Eastern Bengal and Assam, says the Director of that Province, “the policy is to work through men who are called “Associates”, and when a number of associates have taken up individual lines of work, they combine into an Association.

10. The Province of Bengal presents entirely a different type of Association. The Bengal Provincial Agricultural Association is practically a semi-official body, with a member of the Board of Revenue as *ex officio* President and the very Director as Secretary, *ex officio*. All the leading Zamindárs are members. The Provincial Association controls the Divisional and the District Associations. A grant of Rs. 1,000 is annually made to each Divisional association, which has also one Agricultural Inspector attached to it. The Director of Agriculture, Bengal, remarks:—“Without the assistance of the various associations it is almost impossible for the Department to introduce widely improved methods of cultivation.” (See page 78 B. of Agriculture Proceedings, 1911-12.)

11. From this brief survey it will be seen that the Central Provinces associations (or Committees) have been more successful than the others. It is noteworthy that the keynote of success appears to be the close co-operation between the members and the Agricultural Department. It is obvious that for the success of these bodies the following principles must be observed:—(i) the actual management must be in the hands of men actually engaged in agriculture and not having only an academic interest in it; (ii) associations must work in close touch with Officers of the Agricultural Department in their programme of work; and (iii) the work undertaken must be quite definite.

12. The principal difficulties are lack of sustained and systematic work and lack of funds. But I am convinced from my little experience of the Deccan Agricultural Association that the first difficulty will greatly disappear, if before aspiring to improve the farmers associations improve themselves by associating themselves with the Agricultural Department by some provision in their constitution itself.

13. But the greater difficulty is the question of ways and means. And here I must frankly confess that Associations if left entirely to their own resources, can at best show sporadic success. I am not one of those who look up to Government for everything, neither do I believe very much in artificial vitality brought about by perpetual “spoon feeding” from Government. But in the present stage of our agricultural development, just as Government is actively fostering co-operative societies in their beneficent desire to help the ryot, I for one think that agricultural associations also can be made to play a useful part in the organisation of the Department, if pecuniary help is extended in deserving cases. The principle should be “help to those who help themselves”.

14. With this principle in mind, and on the basis of co-operation between officials and non-officials, I would outline the constitution of an association as under:—

- (i) The promoters should raise a small fund by way of a nucleus, say Rs. 1,000 to begin with.
- (ii) They should secure a suitable plot of land either by gift or lease from some member or members.
- (iii) A set of simple implements like iron-ploughs should be purchased from the fund.
- (iv) Provision for a clerk on a small salary to call the meetings, keep accounts, etc., under the orders of the Honorary Secretary should be ensured by sufficient annual subscriptions, to be levied from members in cash or kind at harvest time.

With these things assured the promoters should apply to the Agricultural Department for recognition or registration, and if recognised, notify themselves to the Collector of the District. The Director of Agriculture should nominate a senior Officer of the Department to be an *ex officio* member of the Managing Committee to guide the programme of operations. The Collector should be the *ex officio* President of the Association. He should nominate a suitable number of landholders to be members of the Association, including the Mámlatdár, *ex officio*; but the Chairman of the Managing Committee should be a non-official gentleman, if possible.

15. With such guidance and co-operation between the Agricultural and the Revenue Departments and actual farmers of the locality, matters ought to be business-like, and these associations have every chance of proving useful centres as demonstration farms, as agencies for the sale of implements, as seed growing agencies, etc., in fact as parts of the Agricultural organisation. And in cases where good work is done, the Agricultural Department should annually make a small grant to such associations to supplement their resources, in addition to the other help such as lending their trained men, overseers, supply of seed, etc., as is done in the Central Provinces. I have already quoted the example of Bengal in this respect. The District Local Boards might as well contribute towards the same end as they are competent to spend for such objects. The Deccan Agricultural Association, I may mention, was able to obtain from some Local Boards such help last year for the Organiser they sent round to visit the different associations. In this way I think the Agricultural Department will be able to get through these Associations more abiding and co-ordinate work. The Government of Bombay has always been liberal in the cause of Agriculture and I trust if the Department of Agriculture could devise means of further extending their organisation through such associations, Government, it is hoped, will not grudge a further liberal policy towards that Department. I venture to suggest, by way of a beginning, small grants-in-aid to deserving Associations for some definite schemes, subject to the supervision of the Officers of the Department as outlined above.

16. I have only to add that experience shows that the best method to keep up the interest of Associations is to send round occasionally Organisers and as suggested by me in another place, the Department would be helping the associations a great deal if a few Organisers or Instructors were entertained to work in conjunction with Associations.

B. S. KA'MAT.

INDUSTRIES SUBSIDIARY TO AGRICULTURE

I am not in a position to state authoritatively any definite scheme on the subject, so far as our presidency is concerned; however, I shall try to formulate my own ideas about it. Agriculture itself is described as an industry and the principal one, so far as India is concerned. Land, labour and capital are the principal requisites of it. Climatic considerations can never be ignored. Agriculture is dependent either on the natural rain water or on the artificial supply of water by means of wells and canals, *i. e.*, by irrigation. The crops are then called dry land crops or garden crops. The dry land crops come under extensive agriculture and the garden crops come under intensive agriculture. Crops, depending on rain, have more of an element of uncertainty than those that depend on an artificial supply of water. Rotation is common to both the crops. Manures can more profitably be used for the intensive agriculture. Dry farming would apply to crops depending on rain. The intensive agriculture is for the capitalist and dry crops are generally the poor ryot's crops. Where there is a supply of water, the agriculturist can keep himself, his family and his servants engaged all the year round, and his bullocks will not be unemployed for a greater part of the year. (*)

Thus, his land, labour and capital are constantly engaged and he has little leisure to think of going out himself, to hire himself out as a labourer in large cities, or take away his bullocks and carts there. He will have little need to think of subsidiary industries merely to better employ his land, labour and capital.

Here I have assumed that the agriculturist owns enough land for his ordinary purposes to maintain his family on his own holding, or, to use Mr. Keatinge's expression, he has an "economic holding." If we think of an agriculturist, who is a large land-holder with sufficient capital, with facilities of watering his crops, and who has pasture land, he can devote his attention to rearing cattle, sheep, goats and buffaloes.

Actual instances of such an agriculturist are not wanting. The raising of the stock, sheep, goats, and buffaloes supply him with milk, butter, and manure, and he is following industries subsidiary to agriculture. This he does out of necessity and not necessarily with an idea of following subsidiary industries.

Agriculturists, with small holdings, and raising dry land crops and occupying the strip of the country with uncertain rainfall, are not able to employ their land, labour and cattle all the year round. They are not able to arrange their crops so as to avoid this. It is these persons that try to find out some industries subsidiary to agriculture.

When they are free, they go to the large centres of industry and work as labourers either in the Factories or in the Government Departments, such as the Irrigation, the Public Works, the Railways, and the Docks. They seek labour on the farms of the large land-holders with garden crops or in other industries of private persons, or they take their bullocks and carts to large cities to earn a living. The demand for labour outside agriculture has even caused anxiety in the Agricultural Industry, and the necessity for industries, subsidiary to agriculture, is not so great as it would have been in the absence of the present demand for labour.

The whole village life has been changed under present circumstances. The village is no longer an isolated unit, supplying its own wants, as it was in the days of the old village community, when there were the cultivators and the *Bulutdárs*. The *Bulutdárs* in those days were entitled to perquisites from every villager and were bound to render certain services to the villagers. Thus the carpenter, the blacksmith, the shoe-maker, the Mahár, the Máng, the potter, the barber, the washerman, the Joshi, the Bhat, the Mullana were servants useful to the community or the Government and were remunerated for their services by some interests in land created or conferred by the state.

They thus represented agriculture and some other calling, which was a subsidiary industry to them.

Outside these *Bulutdárs*, who are not yet all extinct, we find certain classes of communities owning lands and following their own occupation as a subsidiary industry, in several villages.

The Census report shows that there are others, such as lawyers, money-lenders, traders and Government servants, who look to agriculture as a subsidiary industry to their profession. Mr. Keatinge has a good word for this class, when they combine their capital and intelligence to improve agriculture, but has a hard word, where they become mere rent-collectors without caring to improve the land. I am not concerned with these classes in this paper, as their case is just the converse of what I am considering.

The question arises, can we look to the callings of the *Bulutdárs* and others as industries subsidiary to agriculture? In cases, where agriculture is the principal occupation and others are merely supplementary to it, these industries in a sense become subsidiary to agriculture.

* For references please see Appendix

These callings do not require any help from the Agricultural Department as subsidiary industries. Some of these will receive a stimulus from the scheme of the Government for manual training. The subject need not, therefore, be pursued further here.*

What other subsidiary industries then could be suggested to this class of small holders, who have some leisure and whose land does not occupy them all the year round? If I use the word industry in the sense of occupation, I can suggest a number of things, but if I use the word industry in a rather strict sense, many difficulties arise in my way.

Just as the increased demand for unskilled labour makes some people believe that there is no necessity for subsidiary occupations for the agriculturists, I believe that the rise in prices of the necessaries of life of man and cattle will make certain secondary occupations remunerative to the agriculturist, which were not so before.

I am not unmindful of the fact that unless an unskilled labourer (agriculturist) earns as much as or perhaps a little more from these occupations than from ordinary labour, he will not engage himself in these occupations. This is the crux of the whole question; but this assumes that every well-bodied agriculturist will leave his home and seek remunerative labour elsewhere, even though the period, for which he can go out, be short. This assumption is not correct. A small landholder can best employ his leisure in embanking his lands and in putting hedges round his fields, by tending extra cattle and getting milk and butter for sale, by keeping goats and sheep, by keeping poultry, hares, pigs, pigeons, and other birds, which command sale. He can even have a small patch of his land covered with tapioca plants(2)*; or, if he has a few trees suitable for lac in his hedges or fields, such as Bor, Bábul, Palas, Kusumb, etc., he can take to artificial lac cultivation (3)*. If he has a tank in his village or at some distance from it, he can even grow 'Shingadas'(4)*. In some villages Edible Mushrooms(5)* are sold, and, if he can be taught the artificial cultivation and if there be a market for it, he may be expected to make money out of it. He might make fibre and ropes out of Ghayapat and other plants, or even make baskets and sundry articles of suitable grasses, bamboo and cane. Several agriculturists take to weaving rough cloth in some parts of the Presidency. In all these subsidiary occupations, the prejudices of the masses and caste considerations are an important factor. Catching fish and making nets, collecting honey, bringing fuel and fodder from the forest for sale, also occupy the time of these agriculturists.

The planting of trees for fuel and fruit might usefully occupy these persons. The planting of mangoes is not unpopular. Even Ericulture(6)* can be tried by these people in their spare moments.

The whole question of subsidiary industries is one of time, place and circumstances and the special facilities of each locality. There is no data, available at present, so as to enable me to recommend a particular item for a particular locality. That work has yet to be done, and the labours of the Deccan Agricultural Association have only been useful to draw the attention of the public to a discussion of the subject.

Any one, referring to the Indian Agricultural Journal and Mr. Keatinge's Book, "Rural Economy of the Bombay Deccan," will find that the ideas, that I have collected together into this paper, are scattered here and there in those books.

An organised systematic effort in this direction on a large scale and over a large area still remains to be made, but I am happy to note, that under present circumstances, with the will, the means, the instruction, the help, and even money, necessary for carrying out this work, will not be wanting. The experiments of the Agricultural Departments, Provincial and Imperial, supply sufficient information on some of the points, and the Department is in a condition to recommend some of the things in suitable localities, and the co-operation of the Department in the encouragement and spread of the subsidiary industries is sure to carry this matter forward and place it on a sound practical basis.

Some of the papers to be presented to the conference will be found to throw light on some of the subjects that I have touched upon.

It may be well for an Agricultural Association to concentrate its attention on some special matters. But where a Department has its jurisdiction extending over a Presidency, it may not be wrong to request it to look to all the parts under its jurisdiction and to recommend to each, what is suitable there. If this view is correct, it may be possible for the Department with its District staff to carry out operations on a large scale, recommending subsidiary industries.

This subject does seem to have been discussed in all its bearings in previous Conferences. It is not too much for a member of Deccan Agricultural Association to request the Department to do this, when its policy is to help and encourage Agricultural Associations in every way, and all the District Officers are expected to be in close touch with the Associations and to help them. The Department will be doing what the Deccan Agricultural Association could not do for want of a district staff to spread subsidiary industries among the Agriculturists to whom they are a necessity.

Certain other aspects in connection with the subsidiary industries must be noticed now. The Department is sanguine to create an economic revolution in the industry of agriculture. When that consummation, devoutly to be wished for, comes about, the

* For references please see Appendix

agriculturists will have more leisure to follow subsidiary industries. Even at present, machinery is a rival to hand village industry. For instance, iron baskets compete with bamboo baskets, and iron wires and ropes supercede ropes to a certain degree.

The extension of Irrigation in the presidency, now under construction or contemplation, will affect the question of the subsidiary industries to a certain degree.

Before a new crop or industry is recommended to the agriculturists, they must be assured that there will be a market for their produce.

There are difficulties for each occupation recommended. Cattle breeding and dairy farming (10)* will be limited to the supply of fodder and demand for the produce. In this branch the difficulty is not of demand but of supply, and probably of fodder and capital. Prices are high enough to make this business remunerative.

Pig breeding can be done by some certain castes, and if cactus and cotton seed hulls can be fed to these animals, the piggery ought to pay. There is already a demand for these animals.

Hares, tortoises and pigeons will fetch prices, and there would be a demand, provided they are sent to centres, where there is a population not strictly vegetarian.

Fish culture can be extended in many parts along the coast and inland. This article of diet is always deficient in supply than there is demand for it. The prices have gone high.

Goats and sheep supply wool, meat and leather. All have gone up in prices and the occupation ought to pay. Fodder limits the industry.

Small agriculturists help themselves by taking their bullocks and carts for purchasing small quantities of grain, oil-seeds, salt, dried fish, etc., and sell these at some distances. This can be encouraged by supplying them with capital on easy terms. This will teach them to sell their own produce and purchase from others. At present the merchant shares a large portion of the profit, which can be made to go into the agriculturist's pocket. Co-operative Credit Societies can take up this subject.

Eri silk can only be recommended on the system of utilising small patches lying waste, as is done in Burma. If good efficient spinning machines can be devised, this industry is bound to succeed. It is so simple and easy to rear worms. Knitting machines will then create a demand for thread. Agriculturists can employ their children and old women in this work, provided they have space in their huts. I would recommend this for an indirect advantage, *viz.*, that the agriculturist will learn how pests on his crops grow space from the eggs laid by moths. Many of his false notions and prejudices will disappear. A demand for this article has to be created. Nadiád farm can supply information about costs of production.

Absence of hedges do at present limit *Rabi* crops in some parts, as agriculturists cannot watch the crops and protect them from cattle. This would apply to an appreciable area of the Presidency. This matter I mention as a subsidiary industry, as it can be introduced at little cost, provided persuasion, nay, even pressure is used and capital is supplied, wherever necessary.

Poultry rearing (7)* is bound to be a remunerative industry. Agriculturists know the practices for economic rearing, and scientific instructions can be imparted in this branch sooner than in other matters. The difficulty of the agriculturists is want of space and at times capital, and want of the knowledge of scientific and sanitary rules to prevent deaths and diseases. The demand and prices are sure to leave a good margin of profit.

Shingada and Tapioca cultivation can be extended. The latter, though not as a field crop, can be encouraged in odd bits of lands now lying useless. Tapioca roots or chaff are found by me to be a good food for poultry. It may be tried for pigs and cattle, if not for men. At the present prices of grain, I believe the poorer classes will purchase the roots, its flour and even arrow root made out of it. The flour of both Shingada and Tapioca can be used in the days of fasting by Hindus. The demand for it can be increased by adequate advertising and pushing of the articles to the notice of the public.

Fodder crops like *Malilotus Alba* should be experimented on and brought to the notice of the agriculturists, if found to be successful. In all these matters assistance should be taken from volunteers and amateurs and from well-off agriculturists, who would not mind the loss of some money and time to demonstrate these matters to their poor neighbours.

The knowledge of the preservation of their crops and fruit and vegetables by agriculturists will be an useful industry. Mango juice, Phanas poli (Jack fruit cake), Sukeli (dried plantains), Dried figs (8)*, preserved peas, Mushrooms and vegetables such as tomato will add to the gains of the agriculturist. Tinning and canning (9)* of these crops ought to be taught and encouraged. These can be done on a small scale. The growing of pine-apples can be made more profitable in this way, even in parts away from markets.

The tastes and wants of city life must be made known in the interior and the agriculturists taught and helped to take advantage of the same. Even now the crust of custom is too thick.

I am not a believer in the "let alone" policy. We can make our large and small land-holders make some profit by artificial cultivation of lac, on the present known scientific lines. I believe that these subsidiary industries must be pushed, so that agriculturists may take better advantage of the co-operative movement.

The difficulties in planting trees can be got over, as Government is prepared to give land to those agriculturists, who are prepared to plant trees for their own profit.

If the small land-holder can be made to stay longer on his land by some of these occupations, better economic results may be expected. The indirect advantages from those subsidiary industries cannot be ignored. A new spirit of enquiry and industry will be fostered.

I will instance it by the artificial culture of Mushrooms. The theory of fungus growth will be observed by the agriculturists, and they will believe in and learn about many a fungus disease of crops better than if mycology pure and simple is sought to be taught to them.

I have so far restricted my remarks to my personal observation, experiments or reading. Persons with better acquirements and experience can surely carry the matter a long way further than a mere amateur can do.

Any one taking up this subject will be struck with the bulletins and ledgers, issued by Government on some of the subjects I have noted above. I suggest that a bibliography on the subject of the industries subsidiary to agriculture be published by the Department for the use of students and amateurs. No student can afford to neglect the American literature on the subject.

In concluding this brief and hurried paper, I thank the Director of Agriculture for giving me an opportunity for bringing this important subject for discussion before the Conference, to which I wish a great success in the interests of the agriculturists.

T. R. KOTWAL,
Sub-Judge, Haveli.

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"A (KADBI) FODDER CO-OPERATIVE SOCIETY."

Rough notes on a Fodder Co-operative Society (private) to be run by villagers themselves.

Entrance fee Re. 1. Shares Rs. 10 either in cash or in kind. Deposits of Kirbi to be received only from the ryots who have raised kirbi.

1. If ryots agree to hand over surplus fodder to the society for safe storage and sale at favourable prices a society should be formed with a managing committee duly elected of not less than 5 persons who will arrange to—

- (1) store in the best manner possible good fodder rejecting bad or grubby fodder;
- (2) give receipts to ryots of amount of fodder received in weight;
- (3) keep record with note of market price at time of deposit, watch market, sell when prices have nearly reached the limit;
- (4) pay money to depositor after deducting an amount of pay at least 6 per cent. to any cash cultivator and to pay working expenses.

(1) The best method of procedure will be to get an open plot in Gaathan from the Collector for temporary use each year; rent free concession will be given at any rate for first few years: a fence of bábul thorns to keep out cattle to be erected: stacks to be thatched or mud plastered. Rakhawaldárs, at least 4, to be appointed on Rs. 3 per mensem to watch in the night time and if the society can afford it one or two special police in places like the Walwa táluka where rick-burning is common. All apparatus wanted is a spring balance to weigh upto 50 lbs. or 100 lbs. and 3 books.

Circular dial balance to weigh upto

100 lbs.	... Rs. 11 8 0
200 lbs.	... „ 12 8 0
50 lbs. oblong	... „ 2 12 0

(2) To compare profits made, the market price at time of deposit should be entered. A receipt should be given to the depositor of weight in lbs. deposited, signed by the secretary and one member and a counterfoil kept. This will be the first book. The second book will be the kháta book in which each man's deposit (dated) will be shown and value, and sale proceeds credited after sale and paid over (his receipt to be taken on the kháta) after deductions about 10 per cent. Reference to be made to page of day book.

The third book, the day book, to show the amounts received in fodder referring to each kháta on one side and amounts received by sale of fodder on the other, also referring to kháta, and date of the payment of such sums to depositor to be noted when paid. It is not desirable to have an accurate system of accounts at present. This will suffice, as the Collector wishes to establish private societies at first.

(3) The society is supposed to watch the market and the season and as soon as it appears that the price will not rise much higher, to sell to suitable merchants in suitable places. Example, month of May: prices high as usual, sell. Month of May prices exceedingly high, hold and watch early rains as if rains are late fodder being now in a highly strung condition will rise higher still. The higher the price of fodder just before the rains the more sensitive it is to a rise on any suspicion of scanty rains as the high price shows there is no surplus left, while it is not likely to drop suddenly even if rains begin well as new grass takes quite 6 weeks to grow and there is no surplus fodder to be sold off. Nothing is lost by waiting. But if prices are not excessively high before the rains, it means there is a good supply of fodder in store over the district and a lack of rain will not send prices up very high while good rain will lower considerably, because there being so much fodder about every one will want to sell off his surplus and the price will go down.

But it is not advisable to wait until the prices have reached the limit (1) because no one knows what the limit will be; (2) it is better to be content with a good profit than to wait and probably find a fall in prices.

(4) It may be that some persons have taken Rs. 10 share (which will be very useful in paying the Rakhawaldárs); they should get quite 6 per cent. which will be a first charge on the profits of sale. The depositor must pay up a certain percentage of his sale proceeds to assist in a reserve fund which will be banked in the savings bank, to pay the Rakhawaldárs or police or both and to provide an insurance against fire.

Fodder deposited at Rs. 10 per 1,000 should sell at Rs. 15 per 1,000 in a good year; at Rs. 20 to 30 per 1,000 in a bad year. It should be quite easy to take upto 15 per cent. on the original deposit or Rs. 1½ out of which 6 per cent. can be paid on any shares at close of the year and the remaining 9 per cent. for expenses and reserve fund. If a man desires that his deposit of kirbi should not be sold for two years he must pay two years' charges.

Thus a man puts in 1,000 lbs. and it is sold for Rs. 15. Market price Rs. 10 at time of deposit. He must pay Rs. 1-8-0 out of his Rs. 15 and will get net Rs. 13-8-0. This on a six months' holding will be 70 per cent. profit; which is ample. If it is calculated that this will not pay expenses; 20 per cent. of his original deposit should be taken. In this case he pays Rs. 2 and he gets Rs. 13 for stuff deposited at Rs. 10 or 30 per cent. profit in 6 months 60 per cent.

Note.—The primary object of the society is to enable the ryot to make a good profit on his kirbi.

2. The secondary object is to induce the ryot by means of this profit to lay down more jowári, (2) to have a store of kirbi available in case of scarcity or kept as the ryot wishes.

A ryot will not retain kirbi long in his own keeping on account of fear of fire or theft specially the former. He sells as soon as he can and he makes little profit and so he prefers to put groundnut and other paying yet very exhausting crops on his land which are non-fodder crops.

It is not intended to encourage speculative dealings in kirbi and no one is allowed to buy kirbi to put in deposit as he would be obtaining the very profit that we wish the ryot himself to obtain.

N. B.—The Sátára district shows a drop in jowári from 5 lákhs to 4 lákhs acres in the past 6 years and increase of groundnut from 28,000 to 92,000 acres.

L. J. MOUNTFORD,
Collector, Poona.

VILLAGE AGRICULTURAL ASSOCIATIONS AND THE DESIRABILITY OF THEIR INCREASE.

Not having much experience in matters agricultural, I am quite conscious that I can never do full justice to any subject relating to the science. But still, I wish to place before the conference what struck to my mind during my lecturing tours. Like any other layman, I had not much difficulty in seeing that the peasant naturally cares more for his crops than for philosophy. And indeed it requires no adept in agriculture to understand that the chief means of livelihood in our country is, for the majority of people, agriculture. But the one parallelism between religion and agriculture that comes fresh to my mind is that, just as in many cases the external forms of ancient religion remain while the spirit is gone and awaits to be re-infused, agriculture is still being carried on in the villages in the time-honoured method and with the primitive implements which our forefathers used at a time when conditions were totally different from what they are at present. In the same way as learned philosophical and religious lectures delivered in towns in no way affect the village people far off, agricultural exhibitions and demonstrations held in towns have not gone far in persuading the rustic farmer to change his mode of cultivation. Even lectures by educated men who have attended the town demonstrations are practically of no avail, since the illiterate villager is not yet prepared to listen to them with any interest. The one important method of spreading agricultural information among the cultivators seems to be establishment of rural agricultural associations. These associations giving, as they do, first-hand information to the people, are likely to appeal to them more readily than any other means. The modern agricultural implements extensively used in the demonstrations of such associations are likely to preach far more effective sermons to the cultivator than any other lecture.

This view of the matter is confirmed by the following facts. In Kurtkoti, my own native place, individual attempts were being made by some educated gentlemen from time to time to prevail upon the villagers to take advantage of the modern improvements in agriculture. But the ryots were not convinced of any necessity for doing so, until, in November last, an agricultural association was established there in honour of a visit paid to the village by Dr. Harold H. Mann, Principal of the Agricultural College, Poona. The work done through this association has manifested itself in really tangible results. Thus the wheat-thresher, the stone-roller, the chaff-cutter and the BT₂ and CT₂ ploughs have found ready acceptance at the hands of the villagers. The cost of threshing with the wheat-thresher has been found to be seven times less than that with the ordinary means. In the case of the stone-roller also, the cost is said to be about six times less. Besides unnecessary cost, the thresher and the roller have been found to save the ryot much time as well as the trouble of being forced to borrow bullocks from others during the busy period of threshing. Comparatively speaking better work is turned out by these two implements. The use of the chaff-cutter for cutting Kadbi saves much trouble and time besides checking wastage. With the ordinary scythe Kadbi could be cut only into large pieces, and a good deal was wasted unconsumed by the cattle. The villagers have also been made to realise the usefulness of the BT₂ and CT₂ ploughs. The thoroughness of the work, the turning over of the soil, the saving of labour, the deep ploughing of the soil and its consequent aeration and exposure to the sun effected by the new ploughs are very much appreciated. Thus by the demonstrations of the association, the cultivators have been convinced of these advantages of the implements. Besides introducing new implements, the association has persuaded people to reserve the whole of the village manure for their own use instead of selling it to other villagers as was hitherto being done. It was through its influence that a uniform rate of wages for picking cotton was fixed and the practice of paying in kind was done away with. The association has supplied good seeds to cultivators at cheap rates. The last but by no means the least, work done by the association, was to prevail upon the cultivators to readily respond to the call of the Agricultural Department and place at their disposal two hundred acres of land growing Cambodia cotton, for the purpose of collecting the best seeds. This part of the association's work met with the high appreciation of Mr. W. W. Smart, Director of Agriculture, who visited the village expressly to see the work done.

Such progress in useful direction can be possible only by creating among the village cultivators a spirit of co-operation, and this in its turn seems to be possible only through rural associations. Town associations have, of course, advantages of their own, but the popularization of new agricultural methods in the villages, which far out-number the towns, should naturally fall to the lot of rural associations, in as much as these can better secure the confidence of villagers. Since owing to various circumstances, root and branch reform in agricultural matters seems impossible in our country in the very near future, the existing state of affairs can be changed for the better only by gradually creating a body of faith among the villagers as regards the agricultural improvements. As factors in bringing about such a change, the formation of rural associations and the giving them every opportunity to facilitate their work, seem to me to be very effective and I have hence placed my thoughts before the conference.

Kurtkoti.

MAHABHAGAWAT.

APPENDIX VII.

RESOLUTIONS OF SUB-COMMITTEES.

*I.—Sub-Committee on Irish organisation of Agriculture and its application to Bombay Presidency.**Recommendations.—*

1. The Government will be pleased to enact a law empowering the District Local Boards to raise at their option, an agricultural rate of 1 pie per rupee on the Land Revenue every year, or, as an alternative, a rate of one anna in the rupee on the Land Revenue, not more than once in twelve years.

In the latter case the capital sum collected should be invested in Co-operative Societies approved by the Registrar; and the interest derived be used annually.

2. That Government under the same Act should contribute annually a sum equal to the income raised by a District Local Board by either of the two means indicated above.

3. That under the same Act the joint fund so raised be handed over to an Agricultural Committee constituted as follows:—

One member to be elected by each Táluka Local Board from its members, a number equal to the total of the representatives of the tálukas to be elected by the District Local Board from its members, and the same number to be nominated by the Collector from persons specially interested in agriculture.

4. That the Agricultural Committee so formed should expend the joint fund on schemes approved by the Agricultural Department, but otherwise should possess exclusive control of the funds.

5. That after 10 districts out of the 19 in the Presidency proper, have formed Agricultural Committees, a Council of Agriculture for the Presidency should be established on the Irish model.

W. W. SMART, I.C.S. (*Chairman*).

V. K. JOGLEKAR.

S. K. RODDA.

G. V. JOGLEKAR.

B. S. KAMAT.

M. B. MARATHE.

P. M. BILDIKAR.

P. K. BIVALKAR.

D. N. DESAI.

P. N. PANDIT.

Y. N. PALSIKAR.

*II.—Sub-Committee on the system of Egyptian Cotton Markets.**Recommendations.—*

1. That Government be asked to nominate persons selected as representing purely agricultural, as distinct from trading interest, to give evidence before the Commission on weights and measures.

2. That Government be asked to empower Municipalities and District Local Boards to establish cotton markets and markets for other agricultural produce such as gal, on commercial lines, similar to those established lately in Egypt.

W. W. SMART, I.C.S. (*Chairman*).

V. K. JOGLEKAR.

S. K. RODDA.

M. B. MARATHE.

P. M. BILDIKAR.

Y. N. PALSIKAR.

D. N. DESAI.

G. V. JOGLEKAR.

III.—*Sub-Committee on the development of Co-operation in Agriculture.*

Recommendations.—

1. It is desirable that the co-operative credit movement should be extended in the benefits of agriculture and that adequate expert advice and supervision should be available.
2. Co-operative methods should be applied to the supply of all forms of concentrated manures in districts where they are required by the agriculturists.
3. Co-operative methods can properly be applied to the supply of seed and food grains, and will prove beneficial to the sowkars as well as to the cultivators.
4. Co-operative dairies should be established within reach of large cities, where the demand is assured and the price steady. Co-operative creameries may in certain localities prove valuable substitutes.
5. The help of the educated classes should be invited to the spread of the co-operative credit movement and should be secured by Divisional Agricultural and Co-operative Conferences; but caution should be exercised in seeing that other sorts of co-operation are not undertaken without a well grounded assurance of profit.

R. B. EW BANK, I.C.S. (*Chairman*).
 VENKATESH SHRINIVAS NAIK.
 CHIMANLAL HARDERAM.
 S. N. KESHWAIN.
 GOPALRAO L. MIRIKAR.
 BHAGWANT BALKRISHNA VAIDYA.
 V. H. GONEHALLI.
 J. A. SALDANHA.
 M. R. TARKUNDE.
 MOTILAL CHUNILAL.

IV.—*Sub-Committee on the Milk Supply of Indian cities.*

Report.—

The Committee are in substantial agreement with the paper submitted by Dr. H. H. Mann, and would make the following suggestions with regard to the matters raised therein :—

The Committee are of opinion that the quality of the milch cattle is deteriorating so far as milk production is concerned. It has been suggested that this may be due to (1) the fact that the best animals are drawn to the cities and are killed as soon as they become dry (2) the fact that famines in the breeding areas have destroyed much of the best breeding stock. There is, in their opinion, a reasonable prospect of it being a paying business to buy dry cattle (buffaloes) from Bombay and other cities, if this is done on a large scale, but this can only deal with the question to a very small extent.

But the essential point, in the Committee's opinion, is to remove the cattle from the cities and keep them outside under suitable conditions, and for this purpose to organise, either by individuals, companies, associations, or co-operative organisations, the establishment of milk farms. Exactly how best this can be brought about, the Committee are not altogether ready to state, and the first thing which is required is to obtain an expert to investigate with regard to each of the big cities, the best places for the establishment of such milk farms, and the best method of organising them whether by co-operative or capitalist agency. But the Committee are absolutely agreed that it is vital to re-organise the whole supply of milk to cities, as the present keeping of cattle inside the larger towns results in the production of milk of low quality at a high cost.

But while the method of supply at present is largely responsible for the high price of very poor milk, it must be recognised that unless a radical improvement in the cattle themselves is made, the industry will not be on a sound foundation. Milch cattle and buffaloes must, in short, be obtained which give much more milk per head than is the case at present. The Committee would suggest the following methods for obtaining this :—

- (1) The establishment of herd books for the principal milking breeds, either by Associations or by Government through the Agricultural Department.
- (2) The maintenance of good bulls of each breed at milk producing centres.
- (3) The co-operation of the hereditary Chiefs, Sardars, Inamdars and other large landowners and gentlemen in maintaining herds of milch buffaloes and cattle in which improvement could be continually taking place.
- (4) The holding of shows of milch cattle and buffaloes in milk producing centres, with substantial prizes.
- (5) The collection of data with regard to the best breeds for each part of the Bombay Presidency.

The production of milk for cities by companies keeping their stock in healthy and suitable conditions (with abundance of water and cheap food) away from the towns must be considered as experimental and liable not to pay immediately, but is so vital to the future health of the people that the Committee consider that Government might, in the beginning, give substantial assistance to such companies in money, land, or other methods, if these would submit to Government inspection. This Government assistance should also be forthcoming for co-operative association of *gowalas*, who would produce good milk and work under similar inspection.

The consideration of the question of conveyance of milk to the markets in the cities is very essential to the subject. Any expert appointed under the proposal in a previous paragraph would have to consider this question, and the railways would have to be approached for special concessions in this matter. Special concessions already exist in European countries.

If the above suggested organisations—especially the co-operative associations of *gowalas*—could be established, the Committee consider that the time would have come for the stringent application of a law against the adulteration of milk. The present law is too clumsy to be applied, but it is essential that some simpler method of dealing with the matter should be early introduced. But the re-organisation of the supply on somewhat the above lines is a necessary preliminary. It might be possible, however, to *cause* the formation of such organisations of *gowalas* by making and enforcing penal laws against milk adulteration, and at the same time holding out prospects of Government assistance as above suggested. If this is so, the Committee feel that the organisation and the regulation of the trade might go on at the same time. If this were done, the application of penal laws against adulteration would not cause a rise in the price of pure milk or lower the profits of the *gowalas*.

In conclusion, the Committee would insist in the exceeding importance of the whole subject. They feel that the securing of an adequate supply of good milk to cities in India is so vital to the health of the people and the future of the community, that there is strong reason for Government being prepared to assist in the organisation of the milk supply to a greater extent than would be wise in almost any other industry.

HAROLD H. MANN (*Chairman*).

CHHOTALAL L. AMIN.

BRIMBHAI M. DESAI.

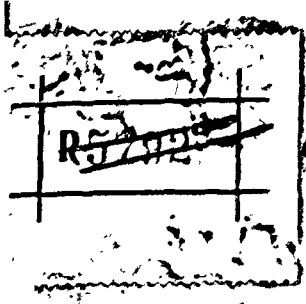
G. H. FROST.

E. H. HORNE.

E. H. P. JOLLY.

G. K. KELKAR.

P. R. MEHTA.



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51913

PROCEEDINGS

OF THE

BOMBAY PROVINCIAL BOARD OF AGRICULTURE

HELD AT

P O O N A

ON THE

9TH AND 10TH JUNE 1920.



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B.P. 50

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LIST OF SUBJECTS DISCUSSED AT THE MEETING OF THE PROVINCIAL BOARD OF
AGRICULTURE HELD AT POONA IN JUNE 1920.

1. A short report of technical results achieved up-to-date by the Agricultural Department to be laid before the Board by the Director of Agriculture.
2. Programme of the specialists and other sections of the agricultural department for the ensuing two years to be laid before the Board by the Director of Agriculture.
3. Programme of cotton improvement as laid before Government by the Director of Agriculture (see my No. 1102, dated 27th January 1920,) as a result of the report of the Indian Cotton Committee.
4. The improvement of the manure supply in the intensively cultivated tracts of the Bombay Presidency including the development of organisation for advice as to manuring. The question of freight on manures.
5. The question of organised attacks on definite plant diseases and of further investigation into them.
6. The great prevalence of epizootic cattle diseases and the policy which should be adopted in regard to them.
7. The development of agricultural propaganda and the part which (a) the co-operative movement, (b) agricultural association and (c) district local boards can take in connection with it.
8. The lines of development of education in vernacular both specially in agriculture and general in rural areas.
9. The closer co-operation between the "development" departments (agriculture, co-operation, irrigation, sanitation, education, etc.) of Government and the methods by which it can be secured.
10. The possibility and utility of establishing divisional boards of agriculture to discuss local problems and to be conducted in the vernacular.
11. The future organisation of the work of the Agricultural Engineer.
12. The financing of the sale of pure and improved cotton by co-operative societies or otherwise.

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**PROCEEDINGS OF PROVINCIAL BOARD OF AGRICULTURE HELD
IN POONA ON JUNE 9TH AND 10TH 1920.**

PRESENT :

- | | |
|--|---|
| <p>The Honourable Mr. G. S. Curtis, C.S.I., I.C.S., Member of Council (President).</p> <p>K. B. Bhadrapur, Esq., Personal Assistant to the Registrar, Co-operative Societies, Bombay, Poona.</p> <p>Sardar P. K. Biwalkar.</p> <p>Dr. W. Burns, D.Sc., Economic Botanist to Government, Bombay, Poona.</p> <p>The Honourable Mr. J. C. Covernton, C. I. E., M.A., Director of Public Instruction, Bombay, Poona.</p> <p>Bhimbhai Morarji Desai, Esq., Deputy Director of Agriculture, Gujarat.</p> <p>Rao Saheb Dadubhai Purshotamdas Desai.</p> <p>A. B. deSouza, Esq., Superintending Engineer, Deccan Irrigation Division, Poona.</p> <p>The Honourable Rao Bahadur S. D. Garud, B.A.</p> <p>The Honourable Dewan Bahadur K. R. Godbole, Mc. E.</p> <p>V. G. Gokhale, Esq., L. Ag., Deputy Director of Agriculture, Konkan.</p> <p>W. F. Hudson, Esq., I. C. S., Collector of Poona.</p> <p>C. C. Inglis, Esq., B.A.I. (Dub.), Executive Engineer, Special Irrigation District, Poona.</p> <p>The Honourable Mr. B. S. Kamat, B.A.</p> <p>G. F. Keatinge, Esq., C. I. E., I. C. S., Director of Agriculture, Bombay, Poona.</p> | <p>J. B. Knight, Esq., M.Sc., Professor of Agriculture, Agricultural College, Poona.</p> <p>Rao Saheb M. L. Kulkarni, Deputy Director of Agriculture, Southern Division, Dharwar.</p> <p>R. B. Maclachlan, Esq., Executive Engineer, Poona Irrigation District, Poona.</p> <p>Rao Bahadur Ambashankar U. Malji.</p> <p>A. B. Modak, Esq.</p> <p>P. C. Patil, Esq., L. Ag., Deputy Director of Agriculture, Central Division, Poona.</p> <p>The Honourable Mr. Purshotamdas Thakurdas, C. I. E., M. B. E.</p> <p>Otto Rothfeld, Esq., I.C. S., Registrar, Co-operative Societies, Bombay, Poona.</p> <p>D. L. Sahasrabudhe, Esq., L. Ag., B.Sc., Agricultural Chemist to Government, Bombay, Poona.</p> <p>C. S. Shirhatti, Esq.</p> <p>M. H. Sowerby, Esq., I.C.V.D., Principal, Bombay Veterinary College.</p> <p>G. Taylor, Esq., M.R.C.V.S., I.C.V.D., Superintendent, Civil Veterinary Department, Bombay, Poona.</p> <p>C. H. Thiselton Dyer, Esq., M.A., Assoc.M. Inst. C. E., Director of Industries, Bombay.</p> <p>D. A. Thomson, Esq., C. I. E., Conservator of Forests, Utilization Circle.</p> <p>C. W. A. Turner, Esq., I. C. S., Collector of Ahmednagar.</p> |
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NOTE.

The President welcomed the members of the Board in a short speech, explaining that this was the first occasion on which a Provincial Board of Agriculture had been held, and stating that he anticipated beneficial results from the discussions in which the staff of the Agricultural Department, members of the Revenue and Irrigation Departments and a number of private gentlemen interested in Agricultural Development would take part. He pointed out that the printed notes on most of the subjects under discussion had been sent to Members and said that it was proposed to discuss the subjects in serial order.

BOMBAY PROVINCIAL BOARD OF AGRICULTURE, 1920.

Subject No. 1.

A SHORT REPORT OF TECHNICAL RESULTS ACHIEVED UPTO DATE BY THE
AGRICULTURAL DEPARTMENT.

1. *General Farming Methods.*—On our various farms we have evolved systems of good clean tillage, proper rotations and adequate manuring suitable to the locality in which the farm is situated, and have standardised the same. The cumulative effects of these operations are very visible in the excellence of the crops obtained and serve as a standing demonstration of what may be achieved. The methods adopted are, year by year, brought to the notice of cultivators, and produce some effect; though it is impossible to form any accurate estimate of its extent.

2. *Implements.*—We have experimented with a large number of new implements and have adopted those most suitable to the work which they are needed to perform in the various tracts, and to the circumstances of the cultivators. These have been brought prominently to the notice of the cultivators, who have taken up extensively the various patterns of ploughs recommended, and to a less extent, harrows, seed drills, mowers, threshers and levellers, as well as the improved furnaces, pans and other apparatus necessary for gul-making. We arrange for the sale, hire and repair of such implements in any tract, in the first instance, until it is possible to turn the work over to co-operative institutions or private agency.

3. *Manure.*—We have demonstrated correct methods of preserving farm-yard manure, but without much success in securing imitation. We have proved and demonstrated the extreme value of nightsoil and poudrette in some tracts where they were formerly wasted, with the result that they are now used to the full extent to which they are made available by the local Municipalities. We have proved and demonstrated the value of San-hemp as green manure for sugarcane, some garden crops and rice in certain tracts and have arranged for the supply of seed where necessary.

In the matter of artificial manures it has been shown that standard mixtures can be applied with great profit to sugarcane, tobacco, onions, chillies, plantains and potatoes. Various nitrogenous manures have been found profitable for rice fields and rice seed beds in various tracts, and on laterite soils, bone-meal has been most successful.

The use of oil cake as top-dressing to sugarcane and other garden crops has been extended and introduced into tracts where it was unknown before.

4. *Crops.*—We have tested and demonstrated the money-making value of various crops in tracts where they were formerly not grown, e.g., dry crop chillies in the Deccan and onions in the Konkan. A notable instance of this kind is the introduction of dry crop ground-nuts of various kinds in many parts of the Presidency, which are not only a valuable crop in themselves, but are excellent as a rotation for either cotton or jowari. In the matter of varieties Shet Parner wheat and Akola bajri have been found to give very good results, and much seed of these varieties has been provided in tracts where they were not before grown. Mass selection of seed has been shown to be profitable in the case of jowari and rice, and seed so selected has been supplied from our farms. In the matter of pure line selection, work is now being done on rice and wheat, but it is only in the case of cotton that it has hitherto been found possible to concentrate the work sufficiently to secure definite results by this method. A very large number of exotics, selections and crosses have been tested in the principal cotton tracts of the Presidency. The four kinds of cotton which we are now pushing are:—

- (a) Surat No. 1-A for the Surat District.
- (b) N. R. cotton for Khándesh and adjoining Districts.
- (c) Dhárwár No. 1 for the Kumta tract.
- (d) Gadag No. 1 for the Dhárwár-American tract.

Of these (a) and (c) are pure strains, and in the case of (b) and (d) pure strains are being selected from the successful varieties.

The advantages of these cottons over the ordinary cotton grown in the respective localities by the cultivators may be roughly summarised as follows:—

(a) Surat 1-A gives 50 lbs. of seed cotton per acre more than ordinary Surat cotton. It has a superiority of 2 per cent. in ginning percentage (= 6 per cent. more lint). The lint is valued at Rs. 15 per khandi more than Surat cotton.

(b) N. R. cotton gives 100 lbs. of seed cotton per acre more than the ordinary Khândesh mixture. It has a superiority of 3 per cent. for ginning percentage (= 9 per cent. more lint). The lint fetches Rs. 20 per khandi more than Khândesh cotton on account of its colour and "bulk."

(c) Dhârwâr No. 1 gives 50 lbs. of seed cotton per acre more than Kumpta cotton. It has a superiority of 2 per cent. in ginning percentage (= 8 per cent. more lint). The lint is valued at Rs. 30 per khandi more than Kumpta cotton.

(d) Gadag No. 1 gives 50 lbs. of seed cotton more per acre than Dhârwâr-American cotton. It has a superiority of 4 per cent. in ginning percentage (= 13 per cent. more lint). The lint is valued at Rs. 5 per khandi more than Dhârwâr-American cotton.

Sugarcane deserves a word to itself. In almost every detail of the tillage, treatment, manuring and watering of the cane, and in the handling of the produce, improvements have been introduced. Apart from this some six new varieties have been shown to be very valuable for certain conditions. The public have made good use of the knowledge gained by us and imparted to them.

5. *Plant Diseases*.—A separate note is submitted on this subject. Fungoid diseases affecting grapes, betel nut, jowari and potatoes have been successfully combated on a large scale.

6. *Horticulture*.—Horticultural investigations have been carried on in the Ganeshkhind Garden, in the now closed Bassein Garden and in selected gardens belonging to cultivators. A thorough investigation has been made of all methods of propagating the mango, and the best conditions for propagation. We are now in a position to say definitely that for dry conditions enarching is best. For moist conditions, whip-grafting gives excellent plants. For the renovation of old or useless trees top-working gives good results. An ideal nursery for young fruit plants of the mango or other species has been devised.

The Bombay mango varieties have been studied, figured and classified. The pruning of the mango has been settled. We have been able to show that the flowers of the mango come on wood of any age and that pruning for fruit is out of the question, though pruning for shape is desirable in the early years of the plant's growth. We have successfully devised means and packages for long distance transport of living mango trees, and have in this manner sent them to America, Africa and Egypt.

The Bombay Presidency has several species of oranges and limes. The question of the best stock on which to bud these was exhaustively studied and the Jamburi, a sour lime, shown to be the best.

We have succeeded in discovering in Sind a nearly seedless guava which we are distributing. We have now worked out two satisfactory systems of pruning the guava, one as a low bush tree and the other on wire (espalier system). The guava lends itself to pruning for fruit as it bears its fruit on a very definite part of the young shoot.

Our studies of vine cultivation have led us to several improvements in the local systems of training the plants, and have resulted in largely increased yields. We have experimented freely with French and American vines, but these have not been a great success.

Our work on the banana has been the collection of all the varieties, and the study of the best manures and methods of cultivation. A combination of the local system of manure with a small amount of artificials has been markedly successful. We have also shown how a profitable inter-crop can be taken.

In the subject of fig we have devised a scientific method of pruning, but have not succeeded, as we once hoped in forcing two crops into the dry season.

Our advisory work in horticulture is of large dimensions. It is a strange fact that although fruit culture is so important in many of the districts of this Presidency, the very simplest rules of soil treatment, irrigation, manuring, intercropping and pruning are often unknown or disregarded. Apart from all advanced scientific results, simple advice has had remarkable good effects on many plantations.

On several of our farms also we have established small fruit gardens where we have tested the suitability of many kinds of fruit trees to local conditions, and we distribute nursery stock of the kinds found to do well.

7. *Cattle*.—A bull breeding farm exists at Chharodi where good bulls of the Kankreji breed are bred and distributed to cattle breeders in Gujarát on terms fixed. There is a keen demand for these bulls. A similar farm is being established in the Dhárwár District for Mysore cattle, and subsequently such farms will be established for Khillari and Krishna Valley cattle. At Tegur in the Dhárwár District the effect of giving better food to the local cattle and grading them up by means of a Mysore bull has been tried. The result has been very successful, and though we started with a non-descript herd of undersized cattle, good bullocks of the Mysore type are now being produced. We procure buffalo bulls of good milking strain for dairy farmers, and keep such bulls for use by the public on some of our farms.

8. *Fodder*.—We have demonstrated the possibilities of hay-making on a large scale, and the best methods of storing hay, the storage in silos of green grass, jowari, maize and sugarcane tops. We have also worked out the best methods of fodder production, and are working at the renovation of poor pastures.

We store hay at Chharodi and shredded kadbi at Kopargaon, for use in famine time.

The system of feeding cattle on prickly pear, as an emergency fodder, which we had previously worked out, was applied with much success during the recent fodder famine, and will, doubtless, form a regular feature of cattle relief on such occasions in future.

9. *Agricultural Engineering*.—The Agricultural Engineer has located extensive sources of underground water in Upper Gujarát and parts of the Thána District, sufficient to turn these areas into a garden. He has also explored the sources of underground water in other parts of the Presidency, and shown that in many localities there is a fair chance of obtaining by boring moderate supplies of water sufficient at least for domestic purposes, and in some cases for irrigation. As a result of this boring campaign a great addition to the irrigation resources of Gujarát and Thána has been effected. Much experience in this work has been gained, and suitable implements designed.

Experiments with power plants, driving pumps, cane crushers, etc., have given valuable experience and the Agricultural Engineer has designed and erected for land-owners many such plants, and has given much advice and assistance to cultivators in the purchase, management and repair of all kinds of agricultural machinery. He also arranges for the training of fitters and engine drivers. He has worked out the problems and cost of steam ploughing in Gujarát and the Karnátak, and shown that under suitable conditions it is a business proposition.

G. F. KEATINGE,
Director of Agriculture.

Discussion of Subject No. 1.

The Honourable Dewán Bahádúr Godbole stated that cultivators often complained that the results obtained on Government Farms were not applicable to their case, because they had not got the capital to apply which Government was able to use. He therefore thought that efforts should be made to apply the methods advocated to the cultivators' own fields and adapted to their resources. He instanced a case that he had heard of in Berar where a farm which formerly produced only Rs. 7,000 worth of cotton was made to produce cotton worth Rs. 23,000 and said that this was the sort of thing that was wanted. He said that the boring work done by the Agricultural Engineer was really valuable, but it was confined to a few tracts, and he would like to see this work enlarged so that the cultivators of other tracts would not have to wait indefinitely for such assistance.

The Honourable Mr. Purshotamdas Thakurdas called attention to the fact that the Departmental programmes showed that in Southern Gujarát work was being done both with Broach Deshi cotton and with Goghári cotton. He said that he would like to know what was the difference of yields between these two cottons, which paid the best and whether the Department could meet the demand for seed.

Mr. Bhimbhai Desai, Deputy Director, Northern Division, said that the ginning percentage of Goghári was 40 to 45 per cent. and of Broach Deshi 32 to 33 per cent., but that this year Broach Deshi was fetching about Rs. 150 per khandi more than Goghári, and at these rates paid better. He agreed that Broach Deshi was likely to be the more profitable cotton in the long run, and said that Goghári was being maintained on the farms only for purposes of experimental breeding, for which purposes its high ginning percentage was an important factor. As regards supply of seed he said that there was a fair supply of improved Deshi seed at Surat, but very little at Broach.

Ráo Sáheb Dadubhai Desai asked whether the horticultural staff could not effect further improvements in the mango and suggested that Government should pay more attention to popularising fruit growing in Gujarát.

Mr. P. C. Patil, Deputy Director of Agriculture, Central Division, replying to the Honourable Dewán Bahádúr Godbole, stated that on our seed and demonstration farms the Agricultural Department did not spend an excessive amount of money. Accounts showed that such farms as those at Jalgaon and Kopargaon paid their own way and showed a profit. The Department, however, did demonstrate their improved methods in cultivators' fields on a large scale and he instanced 40 cotton plots in Khándesh, 40 sugarcane plots on the Deccan Canals and many others.

Dr. Burns, Economic Botanist, replying to Ráo Sáheb Dadubhai Desai, said that it would be very difficult to improve on the present varieties of the mango, that such attempts were being made on a considerable scale in Florida, but had hitherto met with no success. As regards fruit growing in Gujarát he called attention to the economic side of the question and said that except in a few big cities there was little demand for fruit in Gujarát.

Mr. Schutte, Agricultural Engineer, replying to the Honourable Dewán Bahádúr Godbole agreed that the demand for well boring was in excess of his powers of compliance, and referred to his Note on subject No. 11 for discussion by the Board, pointing out that he was asking for additional staff to deal with such work on a larger scale.

Mr. K. B. Bhadrapur said that when improved implements got out of order cultivators found it very difficult to get spare parts, and suggested that spare parts should be kept at large villages with local men.

Mr. Otto Rothfeld agreed with this and said that Co-operative Societies would be glad to keep spare parts if they knew where to get them.

Ráo Sáheb M. L. Kulkarni, Deputy Director of Agriculture, Southern Division, said that the war and subsequent conditions of the markets had caused difficulties in getting spare parts in some cases, but we did stock spare parts on our farms and depôts so far as possible, and hoped that now this supply would increase.

The Honourable Dewán Bahádúr Godbole said that firms like that of Mr. Modak should stock spare parts.

No resolution was passed.

Subject No. 2.

DEPARTMENTAL PROGRAMMES.

It was decided not to discuss these programmes, since many of the matters contained in them again came up for discussion amongst the latter subjects in the programme.

Subject No. 3.

PROGRAMME OF COTTON IMPROVEMENT WITH REFERENCE TO REPORT OF THE
INDIAN COTTON COMMITTEE.

*Letter from the Director of Agriculture to the Chief Secretary to Government,
Revenue Department, Bombay, dated 17th February 1920.*

Sir,

I have the honour to lay before you my proposals regarding the development of the investigation and propaganda work on cotton improvement, as instructed in Government Order No. 9419 of 12th September 1919, Revenue Department, in connection with the Report of the Indian Cotton Committee, 1919, and the Resolution of the Government of India thereon. These proposals are not concerned with Sind, as the matters on which I am asked to report in connection with that province cannot be dealt with until after a conference to be held at an early date with the Commissioner in Sind.

2. The recommendations of the Cotton Committee, so far as the Agricultural Department is concerned, indicate that the work for which it is responsible may be divided into four portions, that is to say, into (1) a survey of the cottons at present in cultivation, (2) the improvement of these cottons by selection or breeding, (3) the multiplication of the improved seed thus produced and the securing of a permanent supply of such improved seed, and (4) propaganda for the extension of the growth of the improved cottons so produced. It should be recognised that over a large part of the Bombay Presidency much has been done already in all these four directions and that what we have now largely to do is to provide for the extension of the work now being carried on, on a larger and more extended scale.

3. For all this work, in the Bombay Presidency, I propose in the first place that the country should be divided into four sections, corresponding with four definite cultural areas now growing different classes of cotton. These are (1) Northern Gujarát, the home of the Dholleras. This would include all the cotton area north of Baroda, (2) Southern Gujarát, the home of the Broach, Surat and Navsári cottons. For convenience the Panch Maháls would be included with this section, though the cotton there is not the same and the conditions are not identical, (3) Khándesh, the great Oomra area of the Bombay Presidency. With this, as the cotton chiefly grown is the same. I would include Násik, Ahmednagar and Sholápur; (4) Southern Marátha Country, where the cottons which would have to be dealt with are Kumta, Dhárwár-American and, to a less extent, Cambodia.

4. The cotton work in each of these tracts is in the hands of the Deputy Director of Agriculture for the Division which includes them. The staff employed and the present state of work is as follows:—

(a) In Northern Gujarát, little has been done, except a very preliminary survey of varieties in cultivation. No special staff is employed, the ordinary district overseers doing all that is done, with an occasional visit from the Cotton Supervisor, from Surat.

(b) In Southern Gujarát, work on selection and breeding of improved Surat and Navsári cottons has been in progress since 1904 and the investigation of Broach cotton and of the possibilities of Goghári cotton for the last five years. For this work a cotton supervisor is employed, with one graduate assistant, (temporary) for breeding work and these work in close association with the

Superintendents of the Surat and Broach Farms. Recently in connection with the crisis in the quality of Surat cotton Government have sanctioned a temporary staff of Cotton Superintendent and three graduate assistants for the extension of the cultivation of our improved strains of Surat and Navsári cotton seed and the multiplication of the supply of seed.

(c) In Khándesh the work hitherto has consisted in the selection of N. R. cotton from the Khándesh cotton mixture and the multiplication and spreading of the seed. So far it has been very successful the seed is very popular, and its extension has been taken up by the co-operative seed societies and unions. Selection has been carried further, but no further *practical* result has yet been achieved. The work here is in the hands of a cotton supervisor working along with the ordinary district staff of the Agricultural Department, who, with the Superintendent of the Jalgaon Farm (which is essentially a cotton seed farm), is responsible for the selection of cottons and also for the extension work in the district.

In Sholápur, which, though under the supervising control of the Deputy Director of Agriculture, Southern Division, nevertheless is an area dealing with Khándesh cottons, all that we are doing is multiplying and spreading the same "N. R." cotton which is being spread in Khándesh.

(d) In the Southern Marátha country the selection and breeding work is in the hands of a cotton supervisor with one graduate assistant working on the Dhárwár Farm. Seed is multiplied to a limited extent on the Dhárwár and Gadag Farms and the further multiplication and extension work is supposed to be in the hands of a Cotton Superintendent and three graduate assistants though we have not been able as yet to find men to fill all the positions temporarily sanctioned for this purpose in Government Order No. 11019 of 18th October 1919, Revenue Department.

5. In considering the increase of permanent staff now required we have to take the recommendations of the Indian Cotton Committee together with the increases of the regular staff of the Department which have taken place or been sanctioned since its recommendations were made. This makes the present proposals less formidable than those of the Indian Cotton Committee. I may say in fact that in view of the sanction now applied for from the Secretary of State by the Government of India for two new Deputy Directorships, I do not propose to proceed with the proposals of the Indian Cotton Committee (paragraph 202) for the appointment of the Deputy Directors specially for cotton. In other matters our local knowledge enables me to modify the proposal of the Indian Cotton Committee, with reduction in cost, without loss, I think, of efficiency.

6. I propose in fact as follows :—

(1) *Cotton Survey, Selection and Breeding.*

(a) One Economic Botanist, in the Imperial Agricultural Service, on the usual pay, who should have general supervision of cotton survey work, cotton selection, and cotton breeding throughout the Bombay Presidency. He would be located in Northern Gujarát, on a station to be established near Sánand (Ahmedabad), and would have sole control of breeding work in the tract north of Baroda. In other parts of the Bombay Presidency, he would be a consulting and advisory officer to the Deputy Director of each Division so far as his special work is concerned. He would need two graduate assistants.

(b) A cotton breeder should be placed in the following three centres—(1) Surat, (2) Jalgaon, (3) Dhárwár—who would work under the direct control of the Deputy Director in consultation with the Economic Botanist mentioned above. Each would be a gazetted officer in the provincial service on a pay of Rs. 200—³⁰/₂—350 per month and would be provided with a station on the farms at the above centres, properly equipped for botanical work. We have suitable men for two of these positions in the cotton supervisors at Surat and Dhárwár—the man at Jalgaon would have to be made. Each of these men would have to be provided with a graduate assistant and the necessary other assistance.

The cost of this section of the work would be as follows :—

	Rs.
(a) Economic Botanist on Rs. 500—50—1,000 or an average of Rs. 750 per month	9,000 per annum.
Travelling allowance for Economic Botanist and staff	2,000 "
Two graduate assistants on Rs. 75—5—100 or an average of Rs. 175 per month	2,100 "
Cost of other staff at Rs. 300 per month	3,600 "
Cost of apparatus and materials and office expenditure per annum	1,500 "
Total running cost of the proposed Economic Botanist's office per annum..	18,200 "
(b) Cotton breeders at Surat, Jalgaon and Dhárwár. Three men on Rs. 200— $\frac{30}{2}$ —350 or an average of Rs. 275 per month	9,800 "
Graduate assistants to cotton breeders, three men at Rs. 75—5—100 or an average of Rs. 87½ per month	3,150 "
Travelling allowance for three men and assistants	2,000 "
Cost of other staff at Rs. 300 per month	3,600 per month.
Cost of apparatus and materials and office expenditure per annum	1,500 per annum.
Total running cost of proposed cotton breeders' office per annum..	20,050 "
Total cost per annum of cotton survey, selection and breeding department	38,250 "

(2) *Cotton Seed Multiplication.*—If we accept the Cotton Committee's proposal, this will involve a number of seed farms, and the necessary staff. I am not quite sure how far all this is really necessary, but it is generally considered by the officers to be so, and I would therefore propose :—

(1) Seed Farm at Sánand in North Gujarát with necessary staff—400 acres.

The capital cost including the breeding station I estimate Rs. 2½ lákhs.

The running cost of the farm I estimate at Rs. 10,000 per annum including one graduate assistant as Superintendent.

(2) Seed Farm near Navsári in the Surat District with the necessary staff—200 acres.

The capital cost including buildings I estimate at Rs. 1,00,000.

The running cost of the farm I estimate at Rs. 5,000 per annum including one graduate assistant as Superintendent.

(3) Seed Farm in the Dhárwár District with the necessary staff—400 acres.

The capital cost including buildings I estimate at Rs. 1,00,000.

The running cost of the farm I estimate at Rs. 10,000 per annum, including one graduate assistant as Superintendent. In Khándesh the Jalgaon Farm will serve the purpose required and will also serve for Sholápur.

The total new annual running cost of this section would be Rs. 25,000 per annum, but it may be taken as certain that these seed farms will pay and that there will be a net annual profit.

(3) *Cotton Seed Distribution.*—In this it is chiefly a matter of staff and I propose that in each of the four divisions I have indicated we have a special cotton distribution staff of (1) one Cotton Superintendent gazetted on Rs. 200— $\frac{30}{2}$ —350 assisted by four graduate assistants normally on Rs. 75—5—100.

Their duties are sufficiently described in the Cotton Committee's Report and we have already made a move in this direction in Surat and in Dhárwár. I propose also that two graduate assistants specially for this work should be added to the Deputy Director's general staff in Sholápur and Ahmednagar.

This would involve :—

	Rs.
(a) Four Cotton Superintendents on Rs. 200— $\frac{20}{2}$ —350 or an average of Rs. 1,100 per month or ..	13,200 per annum.
(b) Eighteen graduate assistants on Rs. 75—5—100 or an average of Rs. 1,575 per month or ..	18,900 ..
(c) Travelling allowances ..	4,000 ..
(d) Office and other expenses ..	32,000 ..

The total running cost per annum would therefore be Rs. 39,300 for this section of the work.

All would not be needed at once, but probably would be required before five years, and Government might be asked to sanction the expense in each area as matters become ripe for it.

The total proposed cost of these developments would therefore be per annum :—

	Rs.
(1) Capital cost apart from that under (2) ..	10,000
Running cost ..	38,250
(2) Cotton Seed Multiplication—	
Capital cost ..	4,50,000
Running cost ..	25,000
(3) Cotton seed distribution—	
Running cost ..	39,300
Grand total—	
(1) Capital cost ..	4,60,000
(2) Running cost per annum ..	1,02,550

These amounts, though large, are much less than contemplated by the Indian Cotton Committee, and I venture to recommend the scheme above outlined for the sanction of Government.

Discussion of Subject No. 3.

The Honourable Mr. Purshotamdas Thakurdas stated the Director of Agriculture had asked for a considerable addition to his staff in order to produce and to introduce improved strains of cotton, as recommended by the Cotton Committee. The Indian Cotton Committee, however, had also recommended legislation controlling the movement of cotton, in order to check the fraudulent mixing of cotton. This mixing was now going on on a large scale, and much short-stapled cotton was being brought to Surat to mix with the stapled cotton there. The cotton that was now put on the market was not pure cotton, and it was of little use to introduce pure cotton in the field if it did not come to the market pure. The fault lay with the petty merchants and at the gins; and the legislation proposed by the Cotton Committee would check the abuses. Until the mixing of cotton was checked in this way he was afraid that it was a waste of money and energy to try to introduce pure strains.

Ráo Síkeh Dadubkai Desai thought that Kaira should be included in the group proposed for Broach and Surat Districts since much Broach Cotton was grown there; he also asked that a special cotton breeder for the Kaira District might be appointed.

Ráo Sáheb Ambashankar U. Malji agreed with the Honourable Mr. Purshotamdas that so long as quantities of short stapled cotton were brought by rail and road to the long stapled tracts for mixing, further expenditure on the improvement of cotton in the field would be wasted. Such movement should be checked.

The Honourable Mr. G. S. Curtis asked how he proposed to stop such movements, especially by road.

Ráo Sáheb Ambashankar U. Malji said that cotton might be checked either when leaving the village or when leaving the ginnery.

Ráo Sáheb Dadubhai Desai said that the large traders could check mixing if they refuse to buy mixed cotton.

Mr. Otto Rothfeld agreed with this and said that he was not in favour of compulsory measures. It was in his view a matter for the traders to deal with.

The Hon'ble Mr. Purshotamdas Thakurdas said that it was not the fault of the large merchants. They had to deal in whatever cotton was brought to them. It is not the large merchants who are hurt by this mixing. They get their commission whether the cotton is mixed or not. It is the cultivator who will suffer from the mixing, and is suffering now. The demand for long stapled cotton is large, but millions of bales of short stapled cotton are lying unsold, and during the past year the cultivators of Gujarat suffered a loss of about 1½ crores on this account. Where there are few merchants in the field much can be done to prevent abuses by a combination of merchants. This was effected at Tinnevely, where there were only about 10 buying firms, but in Gujarát the number of buyers is very great, and nothing but legislation would suffice.

The Honourable Mr. G. S. Curtis said that the question was whether Government was justified in keeping a large establishment for cotton breeding. The Honourable Mr. Purshotamdas Thakurdas wanted to control the movement of cotton by rail. For this co-operation between the people and Government was necessary. The Department set up to administer the old Cotton Frauds Act had failed to achieve its object. He saw many difficulties in the way of the action now proposed. Apart from the question of mixing, however, he thought that the Agricultural Department ought to maintain pure strains of cotton and to improve them.

The Honourable Mr. Purshotamdas Thakurdas agreed that the Agricultural Department should be in a position to supply pure cotton seed to cultivators and that expenditure on this object was fully justified.

No resolution was passed.

Subject No. 4.

THE IMPROVEMENT OF THE MANURE SUPPLY IN THE INTENSIVELY CULTIVATED TRACTS OF THE BOMBAY PRESIDENCY, INCLUDING THE DEVELOPMENT OF THE ORGANISATION FOR ADVICE AS TO MANURES. THE QUESTION OF FREIGHT OF MANURES.

The supply of manures in the intensively irrigated parts of the Bombay Presidency is at present deplorably insufficient. The price of cattle manure is already very high and with, on the one hand, the very large development of canal irrigation which is going on, and on the other, with the very great reduction in the number of cattle which has recently taken place, this supply will rapidly tend to become more insufficient than ever. The deficiency has been made up to a considerable extent by the use of oil cake both from the village oil-presses in every part of the Presidency, and from the oil mills which have been established in many of the large centres; and also to a less extent by the use of fish manure. But the rise in price of these substitutes has been very great and we have now arrived at a position when artificial manures compare, value for value, very favourably with the use of oil cakes or fish. Our experiments, moreover, have shown that in certain cases bone-meal seems to have specific manurial action which renders its use of special advantage: this is particularly the case with rice in the red soils of the Konkan and Kanara. If, however, artificial manures are adopted by the people it will mean that, with such expensive materials,

very much greater care will have to be taken in regard to quality and with regard to purchase than has been necessary with the relatively cheap form of manuring adopted in the past. And hence it will be necessary to develop in a way not hitherto realised an organisation both for testing materials offered for sale and for advice as to the best materials to use.

So far the only artificial manure which has been taken up on a large scale by the cultivators has been sulphate of ammonia for sugarcane. The use of this was extending very rapidly until as a result of the war the price rose to unheard-of heights. Now, however, that the price of oil cakes has also risen, it is being taken up again and 500 tons, I understand, have been disposed of, almost entirely for sugarcane, in the current season. If the price falls slightly I anticipate that next year the demand for sulphate of ammonia will be at least for 1,000 tons and possibly for a good deal more than this. Except for this one material, and for a very small demand for artificial manures for manuring cocoanuts, there has been no further development with these purely artificial fertilisers except for experimental purposes. The demand, however, for bone-meal in the rice tracts of the Konkan shows signs of real vitality, and I anticipate that it will extend and increase.

We have now in the meantime worked out a profitable method of manuring with artificial manures on many of the intensively cultivated crops in the Bombay Presidency, and the results of these experiments and recommendations based upon them will be found in the various publications of the Agricultural Department, and notably in Bulletins Nos. 76 of 1915 and 89 of 1918, copies of which will be available to the members of the Conference.

In summary, therefore, the present position as I conceive it may be stated as follows :—

(a) The demand for manures is increasing ; the supply of cattle manure is now reduced and will probably not attain its old proportion for some years ; prices of oil-cake and fish are very high and for the first time, value for value, artificial manures have become at least as good as any natural manure in the country.

(b) The people have already taken to the use of sulphate of ammonia and it is probable that its employment will rapidly increase at least for sugarcane. Bone-meal is being largely tried for rice : but apart from these the use of artificial manures has so far not gone beyond the experimental stage.

(c) For the adequate manuring of crops particularly in view of the large early extension of irrigated areas, artificial manures will be largely required. As their use is new and they are very expensive, it will be necessary to develop an organisation for testing such manures put on the market and for advising as to the best manures to apply in particular cases.

(d) While definite conclusions as to the best manures to use in certain crops and certain areas are available yet a considerable extension of the activity of the Agricultural Department, in investigating in this direction both on experimental farms and in cultivators' fields is desirable.

So far as an organisation for testing of manures is concerned I would call the attention of the Conference to proposals for legislation on the lines of the Fertilisers and Feeding Stuffs Act of England which are now being considered by the Government of Bombay. These proposals provide for a regular system whereby all artificial manures should be sold with a guarantee of composition and gives power to Government either on its own initiative or on the initiative of any purchaser of such manures to have samples taken and analyses made, the vendor being prosecuted if the artificial manures fails to be up to the guarantee which he has given. I should be glad if the Board could see its way clear to support these proposals. For although little artificial manure is sold at present, yet I have found within the last two or three years that a good deal of what has been put on the market has been far below the quality which the purchaser has the right to expect. I know well the difficulties of the past-two or three years but I think that a purchaser has the right in the case of expensive materials like those we are discussing to be assured that they are of the quality which he expects to obtain.

With regard to the question of advice as to manures this will naturally be either by the various Deputy Directors of Agriculture or by their staff, either as a result of their own experiments or as a result of experiments undertaken by the Agricultural Department. Beyond this the Government of Bombay have already taken a step in supplying to one manure mixing factory (that of Messrs. The Union Agency at Poona) a chemist who will at same time test the manures issued by their firm and give advice on the basis of experimental results obtained by the Agricultural Department to the cultivators who apply to that firm for manures. I think that during the period when artificial manures are a new thing this method is a good one and might well be extended to other firms who establish manure mixing factories. A general control over the advice given should, however, be maintained either by the Director of Agriculture himself or by the Agricultural Chemist to Government.

Again, I think the time has come when the organisation for experiments on artificial manures throughout the Presidency on a practical basis should be extended, and that, under the direct supervision of the Director of Agriculture and on uniform lines, experiments should be undertaken on Government farms in the various parts of the Presidency and also in larger numbers on cultivators' fields. The latter system seems to have achieved considerable success in the past few years. One assistant is already almost wholly employed in organising and supervising such experiments and I think that the time has arrived for the extension of experiments on these lines.

It has been suggested that special facilities should be given in the way of grants of land, etc.; to companies or others who are willing to establish manure mixing factories or manure making factories. I doubt myself whether this is necessary. I feel that if experiments and demonstrations show to the people that the use of artificial manures is profitable they will be taken up and that the factories required will quickly be supplied through ordinary commercial channels.

I might add a word about co-operative manure supply societies. Except in one or two cases I do not think that such societies have been a great success, and I am now somewhat doubtful, except perhaps in the case of the supply of certain forms of oil-cake, whether they are likely to be generally successful. The purchase of manures demands a high degree of commercial acumen and technical skill. The price varies extremely, and by no means regularly from year to year. The quality of any of the samples is difficult to determine and it seems that we have in this matter one of the forms of supply which if carried on by co-operative agency can only be a success when done on a very large scale such as has not been contemplated in the co-operative movement in this country.

The question of freight of manures has already been recently considered by the Government of India in view of a resolution passed by the Conference of Agricultural Chemists at Pusa in 1919, which reads as follows:—

“That in view of the importance of increasing the use of concentrated manures as a part of the general agricultural development of the country, the Railway Board may be approached to arrange that the present minimum rate of one-tenth pie per maund per mile should be charged in all cases of minimum waggon loads of such concentrated manures.”

The Government of India have been unable to accept this resolution, but they are so impressed with the necessity for artificial manures to be as cheap as possible that they have suggested to local governments that the railway companies should be addressed when necessary with a view to reduction in the rates at present charged for concentrated manures. As the immediate necessities of the case here are for a minimum freight for oil cake and sulphate of ammonia I would suggest that the Board request Government to address the railway authorities in this Presidency so as to obtain the minimum rate for these materials throughout the Bombay Presidency. This is essential in the case of oil cake in order that its use may not be diminished and in the case of sulphate of ammonia in order that its use may be more widely extended, and this extension has already been hindered by the very high price of the material in the districts where it is needed.

There is one aspect of the use of manures which I think should also be considered. Professor Knight has shown that the amount of manure used for sugarcane in the

canal tracts of the Deccan may be diminished without lowering the yield of sugarcane. I think that the methods which he has worked out should be more widely known and demonstrated than they are at present. Government has recently sanctioned the arrangement of a demonstration station in the Nira Valley partly for the purpose of demonstrating this method in economising manures. I suggest that the Board should advise Government that the arrangement of a similar demonstration centre in each of the Deccan canal tracts and of demonstrations in addition to the same effect, on cultivators' fields with the necessary staff to supervise them, is a matter of considerable urgency.

H. H. MANN.

Discussion of Subject No. 4.

Dr. Mann said that manures had always been scarce in this Presidency and owing to the recent reduction in the number of cattle by the famine, farmyard manure was scarcer than before. On the other hand, owing to the increase in canal irrigation, the demand for manure was increasing. To some extent fish and oil cake met this demand, but the price of these manures had gone very high, and it was becoming more profitable to use artificial manures. Sulphate of ammonia had been tried on a large scale for sugarcane and gave satisfactory results. Last year the consumption of Sulphate of ammonia in this Presidency amounted to only 500 tons, but if its price goes down a bit there will soon be a demand for 2,000 tons or more a year. The time had already come when cultivators needed protection against the sale of manures which were not what they purported to be. Firms selling artificial manures should be required to give a written guarantee as to the constituents of the manures. Another important point is the railway freight on manures. This is very high when compared with the price of the manures, and adds considerably to their cost. Government should be approached to ask the Railway Companies to charge the minimum rate on artificial manures.

Rao Sáheb Dadubhai Desai suggested that the export of bones and oil cakes should be prohibited. More experiments needed to be done with them, and a complete soil survey of the whole Presidency should be made in order to see what soils these manures would suit.

The Hon'ble Dewán Bahádur Godbole asked the Director of Industries to state what progress was being made with the fish oil factories on the coast and whether the by-products of this manufacture could not be used as fish guano. He also suggested that it might be made a condition of receiving Government assistance for the launching of Hydro-Electric Schemes that the Company receiving such assistance should devote part of the electric power generated to the production for manurial purposes of nitrates derived from the atmosphere.

Mr. A. B. Modak said that one-third of the cost price of artificial manures was due to the charges for railway freight. It was the cultivator who had to pay for this and every effort should be made to bring down these charges to a minimum.

Mr. Thiselton-Dyer, Director of Industries, said that there was only one fish oil factory, established at Kárwár, but it was producing excellent oil and excellent fish guano, which had been sold to the Agricultural Department.

Dr. Mann, Agricultural Chemist, said that he had examined this fish guano and found it to be very clean, dry and richer than ordinary fish manures; but that its cost was rather higher than that of ordinary fish manure. It would be tried experimentally this year.

Resolution.

It was unanimously resolved that the Government of Bombay should be approached to ask Railway Companies to charge minimum rates of freight on the carriage of manures.

Subject No. 5.

NOTE ON THE QUESTION OF ORGANISED ATTACKS ON DEFINITE PLANT DISEASES AND OF FURTHER INVESTIGATIONS INTO THEM.

In the Bombay Presidency the damage to crops by fungous diseases of various kinds is very great. Rust causes immense loss to cereals. The damage done by the vine mildew varies from 4 to 5 lakhs of rupees per annum. The losses caused by the betel palm disease (Koleroga) amount to more than 10 lakhs of rupees per annum. The destruction caused by the potato diseases (Tambera, ring disease and storage rots) is still more disastrous. It is, however, when we turn to the smuts that we find the aggregate losses amounting to more than two crores of rupees. It was therefore one of the earliest activities of the Bombay Agricultural Department to study the methods of reducing these losses, and the

results of our efforts in this direction are very encouraging. We have now come to a stage, in certain diseases at least, when unless organised efforts, to combat these diseases, are made, progress will be very slow. The following are the diseases which have been dealt with.

Smut of Jowar and Rala.—This disease which is of wide occurrence can be easily prevented and therefore the enormous losses (viz., two crores of rupees) caused by the disease can be prevented. The remedy consists in steeping the seed before sowing in 2 per cent. copper sulphate solution for ten minutes. The treatment therefore attracted the attention of the workers in the Department from the beginning and a steeping demonstration was one of the items in all the farms and agricultural shows. It was not until 1910, however, when the mycological section of the Department was created that any definite efforts were made to push on the work. In that year seed sufficient for more than 10,000 acres was treated. In 1911 the work was extended to 150 villages. This increased work naturally created a large demand for copper sulphate and in order to meet the demand small packets of the material with instructions in vernacular sufficient to treat seed for 4 acres were prepared. Since the introduction of this method the propaganda has been carried on very extensively. The packets are prepared for the Department by Mr. A. B. Modak, the Proprietor of the Union Agency, Bombay. Before the War the price of each packet was one anna but now it has been raised to two annas. The popularity of this system can be gauged from the number of packets sold.

Year.	Packets.
1913-14	4,000
1914-15	40,000
1915-16	43,455
1916-17	48,000
1917-18	8,614
1918-19	Nil (famine year).

The work is in the hands of the Deputy Directors who get it done through their District Agricultural Overseers. In many places the distribution of these packets is carried on by the help of Revenue Officers and Agricultural Associations, Co-operative Societies and many public spirited men. It is in the Karnatak that much progress has been made. In 1914-15 steeping was demonstrated in 75 villages of Sholapur District, 17 of Sátara and in 21 Taluka Head-quarters of Belgaum, Bijapur and Dhárwár. In 1915-16 the propaganda was undertaken on a still more extensive scale and as a result there was hardly any important village left in the Karnatak which did not hear of the remedy or make use of it.

The work received a set back in the famine year of 1918 and requires energetic pushing to regain its former position. It is therefore suggested that it should be taken in hand on the same lines as in former years. Experience has shown that the mere sale of the packets does not mean that they will be used. What is required is the presence of somebody at the sowing time, to get the work done by the cultivators.

Koleroga or Gal disease of Betel Palm.—This disease which attacks the Betel Palms is common throughout Kánara, notably in the up-ghát talukas (Sirsi, Siddápur and Yeolapur) where it is very destructive, and also in the Dápoli Taluka of the Ratnágiri District. The disease begins usually in the rains and the affected trees shed their fruits in great number.

The disease can be controlled by spraying the fruit bunches with Bordeaux mixture (consisting of lime and copper sulphate). Spraying is usually done in the beginning of the rains and one spraying has been found to keep the disease under control. The spraying solution is put in special sprayers which are carried, on the back by the climbers, who climb the trees and spray the bunches. According to the present prices the cost of spraying per acre comes to Rs. 10 and by spending this amount a loss of 100 to 200 rupees is prevented. The Department started the spraying demonstrations in Kánara in the year 1912 and gardens were treated at Sirsi and Siddápur. All the work was done at Government cost. Three years' work sufficiently convinced the people of the efficacy of the treatment

and from the year 1915 onwards people began to treat their gardens at their own cost and now, in the Siddápur Táluka, the owners of the gardens where spraying is done willingly bear the expenses. The popularity of the treatment is evident from the fact that the number of sprayed trees has risen from 1,000 in the year 1912 to 20,000 in the year 1919. Some of the gardeners have also purchased the sprayers. While in Sirsi where treatment was restricted to only one garden at Nilekani, the continued treatment of seven years has completely kept the garden free from the disease for the last three years. In the Ratnágiri District where work has been started only at one place *Asud village*, from the year 1917, people have been quite convinced of the treatment. Three persons have purchased the sprayers. Last year the number of gardens treated was 17 and in the coming season all gardeners in the village have consented to treat their gardens. With the limited staff (3 Fieldmen) and the limited grant of Rs. 600 per year at our disposal the work has been sufficiently demonstrated and if it is to be extended on a larger scale more staff and more grant is necessary. If they are available the question arises—"On what lines should the work be conducted?" Whether should it be carried on at different places throughout the tract so as to have a wider publicity or should it be confined to particular places wherein the whole area is to be treated for some time, so as completely to control the disease. Work on the latter line will be more feasible and popular.

Potato diseases—Ring Disease.—The most important disease of the potato crop is the ring disease to control which selection of the seed tubers is the main thing. Cultivators do not practise selection and unless sound seed is supplied there is no hope of controlling the disease. The Union Agency have undertaken to raise a pedigree strain which will be nearly free from the disease and until that strain is grown in sufficient quantity so as to meet the demand there is no alternative but to depend every year on Italian seed which is said to be little attacked in the first year of its importation.

Tamera disease.—It is a serious disease of the kharif crop of potato in the Poona tract and indeed appears to be the factor which limits the spread of the cultivation of potatoes during the kharif season. It is caused by a mite but can be easily prevented either by dusting with flowers of sulphur or by spraying with lime sulphur wash. The treatment is to be given just when the disease makes its appearance and one treatment seems to be sufficient to check the disease. It is only last year that the disease was studied and remedial measures found out. In order to make the remedy widely known a few typical villages at different centres should be taken for treatment. At present spraying, though more effective, is a new process to the cultivators and it is probable that dusting with sulphur from muslin bags will be more readily accepted.

Storage rots.—It is not possible for the individual cultivator to tackle this problem as it entails certain technical knowledge and a sufficient amount of capital. The Union Agency have already undertaken this problem and every encouragement and help should be given to them as they are on the way to solve it.

Grape vine mildew.—The controlling of this terrible disease of the grapes has been one of the successes which the Department can proudly claim. Experiments were started at Násik in 1909 and were continued for three years. From 1912 onwards till 1918, the work was demonstrational. This seven years' work has raised the dying industry to a prosperous condition and now the cultivators do the spraying as one of the routine operations of the crop, at Násik which is the chief centre of grape-growing and also at Ahmednagar, Sántára and Khándesh. The spraying solution used is Bordeaux mixture. Three sprayings are given and the cost of spraying per acre comes to about Rs. 25 per acre which is nothing compared with the profits which have increased from 200 to 1,000 rupees per acre in good gardens. The security which the treatment has given to the crop has induced the people to go in for new gardens and consequently the area under grape cultivation at Nasik has been extended by over 25 per cent. The only help the people probably are in need of is the supply of spraying materials at a cheap rate.

Mildew on Jiru Crop.—The Jiru is an important paying garden crop in the Northern Gujarát but its extension is limited owing to the mildew disease, which

is very destructive to it. Experiments conducted for two years at Nadiād go to show that the disease can be prevented by a spraying with Bordeaux mixture when the crop is about two months old. An expense of 10 rupees, the cost of spraying per acre, will materially increase the cultivator's profits by the saving of the crop which means a gain of Rs. 100 to 150 rupees.

Conclusion.—In all the above diseases the present needs are increase in the areas treated and more thorough treatment of these areas. The work demands special men, or men specially deputed for certain times of the year. Organisations for buying and distributing the materials and apparatus required are essential.

W. BURNS,
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Discussion on Subject No. 5.

At the request of the President, Dr. Burns went through the main points of his printed note, and amplified them in places.

Ráo Sáheb Dadubhai Desai thought that the Agricultural Department should appoint special fieldmen for particular tracts and eradicate the diseases mentioned once and for all. He stated that the work would be of a temporary nature, since the work would come to an end as soon as the diseases were once completely eradicated. He also suggested that the Agricultural Department should find cheaper remedies for the diseases in question.

Mr. K. B. Bhadrapur thought that the packets of copper sulphate should be kept with Co-operative Societies and Unions, with printed instructions, for their use.

Ráo Sáheb M. L. Kulkarni thought that the work should be taken up by Taluka Local Boards and that demonstrations should be given at Mámlat-dárs' Kacheries.

Mr. V. G. Gokhale stated that there were practical difficulties which accounted for the fact that the remedies recommended by the Department were not more generally taken up by cultivators. As an instance of this he referred to the spraying of supari trees for *koleroga* and said that if heavy rain fell within a few hours of the spraying the work was wasted in a large degree. It was difficult to be sure when a break in the rains was going to occur.

The Honourable Dewán Bahádúr Godbole thought that there was no use asking Local Boards to take up this work, but that Village Pancháyats could do the work, when they were started. He thought, also, that this work could be taken up by Co-operative Societies, and could, with the help and advice of the Agricultural Department completely clear single villages of particular diseases.

Mr. G. Keatinge agreed with Dewán Bahádúr Godbole that Local Boards would not be able to undertake work of this kind, but said that he did not think that these diseases could be permanently stamped out even in limited areas, and asked Dr. Burns whether this was not so.

Dr. Burns agreed that it was not possible to stamp out plant diseases, once for all. They could be greatly reduced by spraying and other operations, but would be liable to appear again if such operations were discontinued.

Mr. G. Keatinge said that in view of this it must be realised that the Agricultural Department could not do such work all over the Presidency. The most that it could do was to demonstrate the work for some years, and the work must then be undertaken by other agencies. The question was what agencies were willing to undertake it.

Ráo Sáheb Dadubhai Desai suggested that Talátis should be entrusted with this work.

The Honourable Mr. G. S. Curtis said that the Talátis had their hands full and could not be given additional work of this nature. The aim should be to get non-official agencies to do this work.

No resolution was passed.

Subject No. 6.

NOTE ON THE PREVALENCE OF EPIZOOTIC DISEASES AMONGST CATTLE AND THE POLICY TO BE ADOPTED IN REGARD TO THEM.

To any one directly interested it would seem rather late in the day to question the prevalence of epizootic diseases amongst cattle in this country, and, when I suggested the subject of their control as suitable for discussion by the Board of Agriculture, I did not consider that it would be necessary to emphasise the gravity of the position. Until comparatively recently the absence of cut-

and-dried statistics, and the fact that the experience of those directly affected remained to a great extent unexpressed, would excuse the failure of many to realise fully the annual loss that is occurring from this cause. Progress has been made in both these respects however in recent years. The mortality statistics published in the annual report of the Veterinary Department, while they cannot be accepted as complete, give a less speculative indication of the present position, and should be sufficiently convincing. I append a statement of the figures available for the last ten years. These should be sufficient to dispel any doubt that the control of contagious disease is a problem demanding the most energetic treatment. On perusal of these figures one would be inclined to think that in the last quinquennium the mortality had increased very considerably compared with the previous one. This is not actually the case however and the marked increase in the figures is practically entirely due to the more complete manner in which disease has been reported and investigated. That they are still very incomplete is a fact that can easily be understood when we consider the agency by which they are ascertained. Regarding public opinion, it is interesting to observe how quite lately it has been given expression to in one way and another. While the direct loss due to the death of animals from disease still remains unremarked, except in official documents, the stringency of the milk supply is exercising the minds of the urban and literate classes with the result that a good deal of attention has from time to time been called to the depletion of herds by slaughter or export. It is strange that attention should alight on factors the good or evil economic influence of which is highly debatable, while the enormous dead loss from contagious disease should excite little or no comment. In this respect therefore a little ventilation of the actual position in regard to disease might be useful in guiding public opinion and action in a more truly beneficial direction in the matter of stock conservation. When we consider that while the cattle that are exported or slaughtered are selected and surplus stock, whose value still remains to the country, there is no discrimination in the case of mortality from disease, which entails not only an enormous dead loss in cattle but almost incalculable damage and loss from dislocation of work, etc., there can be no doubt in any mind as to which calls for the most earnest consideration. It is not easy to put in figures what this loss might be but a moderate estimate in sterling of the actual loss in cattle alone based on our figures of the last five years in the Presidency Proper would be £500,000.

Further labouring of a fact that has been more or less patent to the most casual observer for the last half century should not be necessary to the consideration of the question whether all is being done that should be to mitigate the evil.

Before discussing the question of policy in regard to the control of epizootic disease amongst cattle, it would be as well to review briefly the history of what has already been done, in order to appreciate what the policy of Government has been hitherto.

About the middle of last century mortality amongst cattle from disease was occupying the attention of many European countries including the United Kingdom. In 1868 a Commission was appointed to report on diseases in cattle in India and the measures required for their prevention and treatment. The result was the publication in 1871 of a very interesting report, with voluminous appendices of highly instructive evidence in which the whole question was dealt with from every aspect in a very elaborate manner.

The influence of this report on any attempt of Government to deal with the question is rather obscure, and it would seem that no definite move to carry out any of the Commission's recommendations was made until nearly 20 years afterwards. This was probably due to the want of convincing evidence as to the urgency of the demand for any attempt to put into operation proposals that were largely impracticable, or, where they were practicable, would entail a very heavy expenditure. Amongst other things, the commission strongly emphasised the need for spreading veterinary knowledge in the country, and, in 1882, when the Agricultural Department was organised, this need was commended to the attention of the new department. In Government of India despatch No. 21 of April 1882 the importance of taking measures for the investigation and treatment of cattle disease throughout India was urged by Lord Hartington but financial stringency

prevented any definite scheme being adopted. The question seems to have been discussed by various committees—in 1883, and again in 1885—but it was not until the scheme for handing over horse-breeding operations to the Civil Administration in the Revenue and Agricultural Department was adopted that the horse-breeding department, as it then existed, offered itself as a nucleus of a Civil Veterinary Department. The proposals for expanding the horse-breeding department to embrace the duties of dealing with cattle disease and veterinary instruction were detailed in Government of India despatch No. 82 (Revenue and Agriculture), dated 21st October 1891, and were sanctioned by the Secretary of State in 1892. This was the first real step towards the execution of any of the recommendations of the Commission on Cattle Plague made in 1871. The scheme entailed the appointment of 18 Imperial Veterinary Officers, a number admittedly inadequate for the work that the department was required to undertake, the excuse being that strict economy in a costly superior staff was necessary to the development of an adequate indigenous agency. Now although it has been more or less recognised, the need for a Veterinary Department, whose primary function would be to deal with diseases of animals in India, this scheme must be regarded more as an expedient for the more adequate conduct of horse-breeding, which was always urged as having the first and paramount call upon the attention of the department, rather than as a convincing attempt to deal with the problem under discussion. There seems to have been a lack of faith in the possibilities of rendering effective Veterinary Service in India which was ultimately given expression to by the Commission on horse-breeding. It was on the strength of such an expression of opinion that an attempt was made to reduce the staff of the Veterinary Department when horse-breeding was taken over by the Remount Department. A fortunate feature of the department as constituted, however, was the embodiment of a bacteriological branch. The remarkable progress made in ascertaining the nature of the diseases affecting stock in the country, and in evolving methods for their treatment, has had a very far-reaching effect. Further, as facilities were made available for the treatment of animals the demand for Veterinary Service immediately asserted itself. The result was that it was not difficult to produce abundant evidence in refutation of the idea that any attempt to render veterinary aid to stock owners in India was impracticable.

It took a considerable time for the Veterinary Department to be thoroughly established, and, as an agency for dealing with cattle diseases, it had to work under the greatest difficulties. Perhaps the most prominent result of the working of the department was the thorough realization, by all engaged in the work, of the necessity of an adequate native agency to any effective progress. At the instigation of the Inspector General of the Department the question of organizing an adequate Subordinate Veterinary Service was referred by the Government of India to Provincial Governments for consideration in 1893. What was considered necessary then by the Government of India was that the services of a Veterinarian should be available in each Tahsil or Táluka in India. This proposal was discussed at great length by the Government of Bombay but it was not till 1905 that the proposals were entertained. The result was that, in 1907, a scheme was sanctioned for the Government of Bombay for the provincialization of a pensionable Subordinate Veterinary Service that was ultimately to provide a Veterinary Assistant for each Táluka in the Presidency, with a more or less efficient supervising staff. Before this scheme came into force there were 34 dispensaries, *i.e.*, Veterinary Assistants, in the Presidency, and one Inspector. Now we have 64 táluka dispensaries with 88 Veterinary Assistants (of whom 20 are a leave reserve), 5 Veterinary Inspectors and one Deputy Superintendent. This brings us up to the present position in regard to the provision of Veterinary aid as a means for dealing with cattle diseases in the Presidency. It is the only direction in which any action has been taken, and, only from a study of its development can we get an idea of what has been the policy hitherto in regard to the problems entailed.

This brief review of the history of the department does not indicate much except that the slowness marking its progress would show, that, as a solution of the question of reducing the mortality from contagious disease amongst cattle, the spread of Veterinary knowledge was not regarded with much faith. Perusal of the correspondence that marked its history shows that throughout there was

always a considerable element of expediency in its development. In regard to Bombay Presidency itself, from the beginning, the prevailing attitude seems to have been that the duty of Government ended with the provision of facilities for training men who should work as private practitioners or in the employment of local bodies. This policy of placing the responsibility (or the greatest share of it) of providing veterinary service on local boards, while it was realised that local board finances could not bear the burden, would indicate that, although a scheme was ultimately accepted whereby a modicum of the requirements for veterinary service would be afforded, there was a lack of any determination to see the scheme carried out. Throughout, the manner in which the measure of possible progress of the department was subordinated to financial and other expediencies, almost without reference to, or consideration of, its requirements for the work that it was supposed to do, raises a doubt as to whether Government ever seriously entertained any policy based on a complete consideration of the problems involved. Thus the scheme adopted in 1907 was regarded as unnecessarily generous, and, at the present rate of its development, it will take another 26 years before it will be completely carried out.

In considering the question therefore the first essential is to secure a more correct attitude towards it. I do not mean to infer that the need for energetic treatment of this question is not realised to a considerable extent but it appears that the fundamental truth is not fully realised that, in a country like India, where the people themselves fail to apprehend the nature of the problems involved, and where there is practically no articulate public opinion, to effect any progress with sanitary measures, whether amongst human beings or animals, the driving force must come from a paternal Central Government. Only those directly engaged in work of this nature can realise with what degree of the spirit and enthusiasm of the missionary it must be attacked and the little response that can be obtained. I am not unaware of the progress that has been made with public organization in the form of agricultural and co-operative associations but only too often the life and soul of these organizations are embodied in a very meagre sprinkling of individuals and they are not sufficiently established and active to take up the burden of this work. For some considerable time to come the responsibility must remain with the Central Government and if only this fact were fully realised a considerable step forward will have been taken.

With these remarks we can proceed to consider the lines which a more active policy should take.

If we hark back to the report of the Cattle Plague Commission, to the only occasion in which the problem seems to have been fully discussed, we find that, while the ultimate ideal of "stamping out" was recognised to be impossible of attainment, a certain degree of repression was regarded as more practicable than anything that could be done on protective lines. The limitations to the application of such a policy in India were then discussed in the greatest detail, and, except that the Madras Government passed an act for the control of contagious disease which remained until only recently a dead letter, nothing was done on these lines. The position is vastly changed now, however, and while practically the same difficulties remain in the way of a suppressive policy the progress made in our knowledge of the nature of the diseases concerned and in evolving methods of preventive and curative treatment, renders a protective policy the more feasible. So far as any policy has been followed hitherto it has been perforce on protective lines, but the time has come, when, without again unnecessarily discussing in detail, measures which may be correct and thorough in principle, and the difficulties in their application, we should review the position and see to what extent a combined policy of protection and repression is indicated and practicable in the light of past experience.

It has been along these lines that the efforts of the Veterinary Department have been directed, It has been our endeavour to introduce methods of protection and other sanitary measures such as segregation and disinfection as domestic habits. As their adoption by the people is purely voluntary our attitude is of necessity that of the missionary, our work being largely educative. The only tangible representation of the results is to be found in the inoculation returns published annually. It is not so easy to show what success has been attained in

introducing repressive measures, but I fear that we cannot claim to have effect very much in this direction. The success that has been attained with the introduction of anti-inoculation is interesting, however, as establishing the acceptance of such methods by the people in spite of strong initial opposition. Perhaps, this fact shows, better than can be done in any other way, that anti-inoculation is an effective method of dealing with epizootics, for there is no doubt that its popularity is due to the proximate nature of the results and their easy apprehension compared with what can be demonstrated by other sanitary measures too irksome to be carried out. The full utilization of such methods must therefore be regarded as one of the chief instruments in dealing with epizootic diseases, and one of our chief considerations must be how this work can pass from the educative stage to become more effective. As it is conducted at present it has many shortcomings. If we compare the inoculation figures with the mortality statistics for the whole Presidency we find that the latter are not affected notwithstanding a very considerable increase in the former. This of course is due to improvement in reporting mortality statistics from year to year, and they are still too incomplete to form a basis of estimating the effect of the work. To get an idea of this it must be investigated in the field in individual outbreaks. But even then we are forced to the opinion that, while under favourable conditions anti-inoculation is very effective, it is on comparatively rare occasions that the work can be done in circumstances essential to its success. This is largely due to the fact that the work is carried out on a voluntary basis, but one of the chief reasons why more success has not been attained is the inadequacy of the staff to cope with the demand for their services. Now, whether the work is to remain voluntary or not, if the application of modern methods of preventive treatment is to be regarded (and to me it seems it must be) as one of the chief aims of our policy, it would be as well to recognise at once the need for an adequate and properly organised Veterinary staff. It is possible that the habit of viewing such a proposition from a purely financial aspect will raise in the minds of a few a doubt as to whether the country can afford such a luxury. To allay any doubts on this score, however, I should like to point out that the value of an efficient veterinary service to a country like India is not limited by what it can effect in dealing with contagious diseases alone. Reference to the past work of the Veterinary Department, as it has hitherto existed, should be sufficient proof of this. Not only has it been responsible for any progress that may have been made in stock-breeding but the following figures show what has been done in the matter of treating all classes of stock for every-day non-contagious ailments, which, it is well-known, cause very considerable loss.

Year	Staff.	Inoculations performed and per cent. per man.		Treated on tour and per cent. per man.		Treated at the dispensaries and per cent. per man.		Castrations.
		Inoculations.	Per cent.	Treated.	Per cent.	Treated.	Per cent.	
1908-09	33	6,897	209	15,983	484.3	56,550	1,713.3	15
1918-19	64	29,509	461.07	53,426	834.7	1,36,426	2,131.6	1,470

It is difficult to put in figures the value of this work and it can only be appreciated by careful observations in the field. What the above figures do show, however, is that the work has increased in direct proportion to the facilities made available; and, when we consider that the effective sphere of influence of a Veterinary Assistant, with a well-equipped hospital, so far as this class of work is concerned, is practically limited to an area of 6 to 8 miles radius, we can see what an enormous field still remains untouched in the Presidency. In point of fact the success that has been attained in this respect has forced upon us, who are engaged in the work, the feeling that it is in this direction that our services are of a greater economic value to the country than what we can do in regard to epizootics under present conditions; and it only bears out the opinion shared by many that a complete veterinary service, adequately trained in modern ideas of Zootechny generally, must be essential to the economy of India which is so dependent on her agricultural stock, the capital value of which, in Bombay Presidency alone, I estimate at roughly, £50,000,000 sterling. There should therefore be no compunction on the ground of expense

in accepting the more rapid development of the Veterinary Department as part of our policy. Further, from the nature of the work that is required to be done, an important point to be recognized is, that the standard of skill and training necessary should not be governed by financial expediency but should be based on scientific progress in the matter of animal hygiene and sanitation generally.

Granted that an efficient veterinary service be provided we have had sufficient experience to know, that, without that its operations are backed up by the force of law, it must remain to a large extent ineffective, and much valuable time and energy will have been wasted.

Without suggesting that elaborate legislative measures for the control of disease are feasible, no matter how desirable they may be, I should like to indicate how certain simple measures might be introduced with considerable advantage.

The first essential to dealing with disease in any manner is early information. There can be no doubt that much of our work remains sterile at present owing to the dilatory manner in which the incidence of disease is reported. This is one of the multifarious duties of the village patel, but only too often is it neglected until a Veterinary Assistant has visited his village on information of the presence of disease already having reached him from other sources. This neglect cannot be regarded as due to any failure to apprehend the presence of disease and its serious consequences, although this is the excuse usually offered, but to a complete apathy to public interest. There is, on these grounds I consider, sufficient justification for fixing the responsibility of reporting disease and making its neglect punishable.

The importance of early reporting cannot be too strongly emphasised, because, on sufficiently early receipt of information hangs the possibility of applying other measures that may be desirable. Such measures would include the control of movement and segregation of sick animals, etc., and, as the difficulty and inconvenience of applying such measures are in direct proportion to the area to which they apply, it is very important that action should be taken before the disease spreads to any extent. In fact I doubt very much if the proper application of repressive measures would be practicable if the area extended much beyond the village. So far as measures of this nature are necessary in amplification of protective methods, I am inclined to think that it would not be impossible to adopt the village as a sort of unit area to which they might apply. Even now our figures denoting the number of outbreaks reported really represent the number of villages affected. I should even go so far as to say that if action were taken early enough the focus of infection could be reduced to the household, in which case matters would be simpler still.

As to the measures necessary they need not be very elaborate. The first to consider is the control of movement of sick animals or their isolation. Hitherto it has been considered necessary for this purpose to establish special pounds. Pounds would not be necessary however if the restrictions were applied within a reasonable time of the first appearance of the disease, and, in the majority of cases, it would be more practicable and convenient for sick animals to be confined to their own households. The danger of further spread of the disease in the village could be immediately controlled by inoculating all the healthy animals. Even the healthy animals in the same stable with the sick could thus be protected. On inoculating, however, we often find that a certain number of animals, although apparently healthy, develop the disease shortly after inoculation, showing that they must have been in the incubative stage of the disease when inoculated. In this way the presence of the disease is often prolonged beyond the period of immunity conferred by inoculation, rendering re-inoculation necessary. In fact it would be necessary to re-inoculate every fortnight or three weeks until at least a fortnight after the disease has disappeared. To prevent the disease spreading to other villages it would appear necessary that no cattle should be allowed out of the infected village. Where inoculation is carried out however such restriction need only be confined to the animals living in infected stables or yards, both sick and apparently healthy, as we find that most of the cases in which the disease appears after inoculation or those which have lived in the same stable with sick animals, that is, which have come in very close contact with the disease.

It will be seen therefore that complete inoculation of all healthy animals, and re-inoculation if necessary, is the essential to success, and restriction of

movement is subordinate to the extent to which it can be carried out. A question for consideration therefore is whether it should not be made possible to enforce its acceptance by law. Such an idea I fear will raise terrors in the hearts of some but if we examine the question carefully we find that there is really nothing inherent in the operation to which any valid objections could be taken. The manner in which it has been accepted in all parts of India on a purely voluntary basis, with never a complaint, should be sufficient proof of this. In our experience we find that any objection to its use is usually met when it is first introduced, and, if the people are not too busy and can put up with the little trouble it entails, their suspicion can as a rule be allayed by a little tactful persuasion—especially if we arrive on the spot before the disease has run a prolonged course. Cases of flat refusal can generally be traced to the machinations of the ubiquitous obstructionist playing upon the superstitions of the people out of sheer truculence. Where it has once been carried out successfully the people are as a rule glad to come and ask to have inoculation done again as necessity arises. Any objection that could be raised to such a step could only be based on sentiment which would die down in a very short time.

In addition to these measures there is the disposal of infective material. In this respect comparatively simple methods of disinfection would be necessary but what is most urgently required is to control the disposal of infected carcasses. It is not necessary to describe the present custom, and its attendant evils, whereby such carcasses become the perquisites of the village Chamars. Not only are what may be regarded as their legitimate methods of disposal to be condemned but the custom lends itself to appalling abuse and cases are by no means unknown where Chamars have actually spread infection maliciously to the great loss of agriculturists. If India can lay claim to any progressive tendency at all surely the removal of such a weakness in her domestic economy is not unthinkable.

Although repressive measures on these lines would supplement to a very advantageous extent our protective methods, there still remains the wider question of prevention of the spread of infection from neighbouring States and provinces, grazing grounds, cattle fairs and by dealers, herds, etc. From this aspect the facilities for the spread of disease appear almost unlimited. Inadequacy of staff has prevented the Veterinary Department from seriously tackling this question, and it will be some time before we have the necessary information on which to base anything like practicable proposals for dealing with it. Meanwhile I should prefer that discussion be confined more to protective measures on the lines I have tried to indicate.

The possibility of introducing legislation of this nature in India, to my mind, is apt to be regarded with unnecessary pessimism. We know there are difficulties to be overcome which it is the habit to sum up in the general statement that the country is not yet ripe for it. It is by no means a new departure, however. Madras Presidency has had an Act passed for the control of contagious diseases since 1866, and although it may have remained to a large extent a dead letter it was there when opportunity arose for putting it into operation. This opportunity arrived with the development of the Veterinary Department, and now, I am led to believe, it can be used with considerable advantage. It only requires to be altered in accordance with modern conditions to make it very useful indeed. In Burma also a similar act is in operation. Again all over India we have had the Glanders and Farcy Act and other similar acts in operation for some considerable time and our experience of their working should have a reassuring effect on those especially who anticipate difficulties in the form of corrupt abuse of powers conferred by such legislation. Perhaps the most reasonable objection is the want of a competent agency by which any measures that may be enacted can be operated. This should largely be removed, however, when we have the village Panchayats the constitution of which is now under consideration. The question is so intimately concerned with the domestic economy of the village that the Village Panchayat should be a very competent authority for the administration of legislative measures on these lines. In fact the execution of a duty of this nature would be an excellent training for these new councils, and I would suggest that to include this amongst the other duties prescribed in it would render the Village Panchayat Act more complete. It would help to develop a sense of responsibility to public interest which is so much wanting in this country.

Without attempting to deal with the problem of the control of contagious diseases in cattle exhaustively, I have tried to indicate, in general terms, the lines on which, to my mind, a practical policy might take. My views may be summed up as follows:—

1. To meet the increasing demands of the agricultural and other allied industries the adequate control of contagious diseases of animals calls for immediate and energetic action.
2. The responsibility in this respect must remain for a considerable time to come with the Central Government.
3. A combined policy of protection and repression, if adequately carried out, offers the best prospect of success under present conditions.
4. To carry it out, a sufficient and adequately trained veterinary staff, with the supplementary legislation to enable the full utilization of all modern protective methods of treatment, should be created with expedition.

G. TAYLOR,
Superintendent, Civil Veterinary Department.

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Year.	Equine.						Bovine.						Others.		
	Glanders.	Anthrax.	Surra.	Dourine.	Others.	Total.	Rinderpest.	F. & M. disease.	H. S.	B. Q.	Anthrax.	Others.	Total.	Other ovines.	Total.
1909-10	6	1	325	..	4	336	1,520	62	3,651	1,125	523	137	7,018	..	..
1910-11	6	..	411	..	3	420	2,249	79	3,292	623	752	153	7,148	..	..
1911-12	4	3	141	..	3	151	1,810	83	1,779	1,609	536	..	5,817	..	..
1912-13	6	1	34	..	3	44	2,200	189	704	211	674	28	4,006	..	..
1913-14	13	3	127	..	1	144	2,103	153	1,008	167	495	4	3,930	..	..
Total	35	8	1,038	..	14	1,095	9,882	566	10,434	3,735	2,980	322	27,919	..	..
1914-15	43	..	116	..	1	160	6,833	99	1,494	198	584	..	9,203	15	15
1915-16	5	..	145	..	3	153	13,168	291	1,157	1,024	379	49	16,068	14	14
1916-17	36	..	56	..	6	98	18,509	284	2,229	4,180	452	21	23,668	35	35
1917-18	91	..	230	..	11	332	13,944	349	5,223	848	158	3	20,825	165	165
1918-19	5	..	149	..	3	157	8,597	635	689	273	185	14	10,393	..	..
Total	180	..	696	..	24	900	61,051	1,653	10,892	6,523	1,758	87	81,957	229	229

Discussion on Subject No. 6.

Mr. G. Taylor referred to his printed note and said that he would be glad to know the opinion of the Board as regards the proposals made therein.

The Honourable Dewán Bahádur Godbole asked whether it was suggested that legislation should be introduced making the inoculation of cattle compulsory, in the case of epizootic diseases, and on *Mr. Taylor* replying in the affirmative said that he considered that such legislation would be premature.

The Honourable Mr. Purshotamdas Thakurdas said that the quality of the cattle in this Presidency was fast deteriorating, and that Government was to some degree responsible for this. He asked what was the opinion of experts on this point and expressed his view that it was due to the slaughter of good milk animals in Bombay, which are sold to butchers when they go dry. Milk was becoming steadily scarcer and dearer. This also he attributed to the cause mentioned above. He regarded the situation as very serious.

Mr. G. Taylor said that he could hardly agree with the above view. It was very difficult to say whether cattle were deteriorating or not, but he did not know what evidence there was that deterioration was going on. It was true that milch cattle were slaughtered in Bombay when they went dry; but this usually happened when milch cattle were brought to a town, because it did not pay to keep dry animals in a town. The price of milk had risen all over the world. He did not think that Government were neglecting the question of cattle.

Mr. G. Keatinge said that milch animals certainly were slaughtered in Bombay when they went dry, but considering that these animals were drawn from Gujarát, Káthiáwár and Northern India, he did not think that the number slaughtered could be regarded as very serious in relation to the number of cattle of those areas. The question was considered by a Dairy Committee held in Poona a few years ago, which came to the conclusion that so long as milch cattle were kept in Bombay, this slaughter would continue, and that the proper way to deal with the problem was to keep the cattle away from Bombay and to bring in the milk by train. He hoped that the Board would express an opinion as to *Mr. Taylor's* proposals for legislation to deal with cattle diseases.

The Honourable Mr. B. S. Kamat said that the people were not yet ready for legislation either to make the reporting of diseases compulsory or to make inoculation compulsory. The history of plague showed how difficult it was to make people recognise the value of inoculation, while as regards compulsory reporting, the people would not know what diseases were contagious and what they have to report.

The Honourable Dewán Bahádur Godbole agreed with *Mr. Kamat*, but thought that when Panchayats were established they might be of use in the matter of reporting diseases.

The Honourable Mr. B. S. Kamat asked whether legislation of the nature proposed, which had been undertaken in Madras and Burma, was not a dead letter.

Mr. G. Taylor replied that the Madras legislation had remained a dead letter until the Veterinary Department was strong enough to deal with epizootic diseases; but now that the Veterinary Department in Madras had been strengthened the legislation was found very useful. He did not know what had happened in Burma.

Ráo Sáheb Dadubhai Desai thought that a Veterinary Dispensary should be established in each taluka, and until that had been done there was no use introducing legislation.

Discussion on Subject No. 7.

“ THE DEVELOPMENT OF AGRICULTURAL PROPAGANDA AND THE PART WHICH (A) THE CO-OPERATIVE MOVEMENT, (B) AGRICULTURAL ASSOCIATION AND (C) DISTRICT LOCAL BOARDS, CAN TAKE IN CONNECTION WITH IT.”

No printed note was submitted to the Board.

Mr. Otto Rothfeld stated that till recently the Co-operative agencies had confined their efforts mainly to the provision of credit. They were now establishing other kinds of societies on co-operative principles, and hoped to have societies for helping the agriculturists in buying implements, seed, etc., and in selling their produce. Such societies should be kept in close touch with the Agricultural Department. Some Urban Banks are talking of establishing Dispensaries. This needs close touch with the Medical Department. In Sind Co-operative Societies are trying to remove irrigation difficulties. This needs close touch with the Irrigation Department. Societies are also starting night schools. This needs help from the Educational Department. So far as agricultural propaganda is concerned he thought that the Unions might perform the function of the *Syndicat Agricole* in France. Each Union would form a rural club for the study of agricultural problems and for propaganda, and would have its primary societies grouped round it. Closer touch is needed between the Co-operative Department and other Departments concerned. Indeed the Co-operative Department is not really a Department, but a huge popular movement needing technical help from the Departments that can give it.

The Honourable Mr. B.S. Kamat said that the present agricultural Associations were only nominal bodies. They had no funds, could not employ trained men, and did very little work. Without funds they would never be able to do much. He read a Report showing that the Agricultural Organisation Society in England received a grant of £12,000 annually from Government and was asking for an increase in the grant. He proposed that a strong Society of this kind should be formed, and that Government should supply funds to make its working successful.

Mr. J. B. Knight said that it was not possible for a Central Department to get into touch with all individual cultivators, and that he found by experience that the Agricultural Associations which we had known did not fill the gap, and that in many instances they did nothing at all. He thought that it would be very useful if the Agricultural Department and other Departments availed themselves of the machinery of the Co-operative Societies for propaganda work, and said that other Departments could easily keep the Registrar informed on the matters on which the Societies could undertake such work.

The Honourable Ráo Bahádur S. D. Garud said that he entirely agreed with Mr. Kamat. Agricultural Propaganda should not be left to private charity, but Government should find the necessary funds. The Agricultural Department had very few overseers and it was necessary to enlist unofficial agency in the propaganda work. The Co-operative Department would provide the machinery for this, and the Agricultural Department should provide the funds.

Mr. K. B. Bhadrapur said that Co-operative Societies already did a good deal of agricultural propaganda work, and it would be quite possible to arrange that they should do more.

Ráo Bahádur Ambashankar U. Malji agreed with the previous speakers. The Co-operative Societies and Unions could certainly help, especially with the quasi-commercial work of the Agricultural Department, but the Agricultural Department must be prepared to find them funds, as Societies doing this kind of work would require whole-time workers.

Ráo Sáheb Dadubhai Desai thought that work of Agricultural propaganda should be handed over to District Local Boards.

Mr. G. Keatinge welcomed the offer that Co-operative Societies and Unions should undertake the work of agricultural propaganda, and thought that the time had come when agricultural associations might be merged into Co-operative Societies, and pointed out that in some countries Co-operative Societies undertook the most extensive agricultural propaganda and did all the work that could be expected from agricultural associations.

Mr. V. G. Gokhale said that in the Konkan agricultural Associations were a failure, and might with advantage be merged into the Co-operative Unions, provided that the latter were prepared to have demonstration plots and do some useful work.

Mr. Otto Rothfeld welcomed the idea of merging agricultural associations into Co-operative Unions, and believed that the latter could undertake propaganda work with success.

Mr. P. C. Patil said that some of the Agricultural Associations in the Central Division had funds and were doing good work and asked whether it were proposed to abolish them.

Rao Sahab M. L. Kulkarni said that in Southern Division also some Associations were doing good work and needed to be encouraged and not abolished.

Mr. G. Keatinge said that there was no question of abolishing Agricultural Associations which were doing good work, but that he thought generally that advantage could be gained by merging their activities with those of Co-operative Institutions which had funds and were prepared to take up the same kind of work.

The Honourable Mr. G. S. Curtis said that the Heads of the two Departments could arrange for making the link between the Agricultural Associations and the Co-operative Unions.

The following Resolution was proposed by the Honourable Mr. B. S. Kamat, and carried :

Resolution.

“ This Conference recommends that there should be secured greater co-relation between the Agricultural Department and the Co-operative Department than at present for purposes of propaganda work and Agricultural Co-operation, and such Associations should be guided, supervised and financially helped by Government in suitable cases. ”

Subjects Nos. 8 and 9.

LETTER FROM THE DIRECTOR OF PUBLIC INSTRUCTION, NO. 16397, DATED
16TH FEBRUARY 1920, TO THE SECRETARY TO GOVERNMENT, EDUCATIONAL
DEPARTMENT, BOMBAY.

With reference to paragraph 3 of Government Order No. 7048, Revenue Department, of 4th July 1918, I have the honour to enclose reports from Inspectors and extracts from communications from certain of the district officers consulted and to offer the following remarks :—

2. The Educational Inspector, Northern Division, points out that Agriculture was taught in High Schools as long as 1881-86 and was attempted in primary schools about 12 years ago. Both efforts proved failures not for lack of teachers and equipment but because public opinion was opposed to a policy under which a highly technical subject was forced upon schools intended for general education. Similarly the ‘ Rural Standards ’ and the ‘ Agricultural Readers ’ proved also unpopular and were discontinued. The Inspector, therefore, is against the production of a special agricultural syllabus or agricultural text-books for use in ordinary primary schools. He would not teach agriculture in vernacular standards IV and downwards, but favours the establishment in each district of a special agricultural primary school on the lines of that at Loni. As regards the points raised in paragraph 10 of the resolutions of the Conference the Inspector accepts those relating to the inclusion of nature study in the course of rural schools, the adjustment of all subjects to the needs of rural life, the provision of a school garden for rural schools, the institution of vacation courses by the Agricultural Department for the benefit of rural teachers. As regards other points he explains that in Gujarát primary schools are already staffed largely by men from rural areas and selected primary teachers are appointed to the Inspecting staff, that if agriculture is not to be introduced into the primary stage a special training school for teachers

will not be wanted, and that there is no objection to recruit for the Inspectorate a larger number of graduates in Science or Agriculture although the supervision of agricultural schools should necessarily remain with the Agricultural Department.

3. Of the district and other officers consulted by the Educational Inspector, Northern Division, Mr. Hood (Collector, Kaira) accepts suggestions (a) to (e) in resolution no. 10 of the Conference, as do Mr. Smart (Collector, Panch Mahals) and the President of the Broach District Board. The views of Mr. Emanuel (then) President, Surat District Board, are attached. While he accepts the principles underlying (b), (c), (d), he sees difficulties and as regards (e) is not sure that rural teachers should be trained apart from urban. In this last matter he differs from Mr. Smart who holds that the training of rural should be quite distinct from that of urban teachers. The President, Thana District Local Board, does not favour school gardens because most school masters have no idea of gardening. He insists on the necessity of separate training for rural teachers and accepts suggestions (a) and (b). Mr. Bala, Principal, Training College for Men, Ahmedabad, would not have separate text-books for urban and rural schools but would revise the present series so as to adapt it better to rural needs. He accepts suggestions (a), (b) and (c) but is opposed to separate training institutions for rural and urban teachers.

4. Mr. Hungund, Educational Inspector, Southern Division, urges that nature study is necessary for urban as well as rural schools. He is opposed to a restriction of outlook to merely rural matters in the teaching of the three staple subjects to rural pupils and he states that the Collectors of Dhárwár and Kolába (Messrs. Haig and Bharucha) agree with him. He accepts suggestion (c) but refers to difficulties of finance and irrigation. As regards (d) he quotes Mr. Haig: apparently the Inspector and Collector agree that the staff in rural schools should not be restricted to "Castes practising agriculture". The rest of the suggestions of the Conference Mr. Hungund accepts. Mr. Pratt, lately Educational Inspector in Sind, is opposed to the adoption of separate text-books for urban and rural schools but would revise the present books. He accepts suggestion (a), but as to (b) considers that there is a risk of pushing a platitude to an illogical extreme. He does not favour gardens for village schools and as regards (d) points out that in Sind most teachers are drawn from the rural population and that not a few of the Inspecting staff come from villages. He is quite opposed to separate training for rural teachers and sees no advantage in vacation courses in agriculture for rural teachers but would not object to the inclusion in the Inspectorate of Science or Agricultural graduates if "the men appointed are capable in other ways".

5. Of the district officers consulted in Sind, Mr. Rothfeld (Collector, Sukkur) would have nature study in urban rather than rural schools. He favours suggestions (c), (d), (e), (f), and has no objection to (b), as regards (g) while recognising the desirability of having some rural representative on the Inspectorate, he lays stress on the necessity of recruiting generally the highest qualified University men therefor, and doubts the usefulness of Science or Agricultural graduates, in this connection. The views of other district officers were forwarded later by the present Inspector Mr. Grieve. I attach copies of statements by the Collectors of Karachi, Hyderabad, Thar and Párkar and Lárkána, which are of some special interest. It will be noted that these Collectors are all opposed to the direct teaching of agriculture in ordinary schools and indeed to the "over-agriculturalising" of the school courses generally. While the Collectors of Karachi and Lárkána practically accept (with certain qualifications) the suggestions of the Conference; the Collector of Hyderabad is definitely opposed to (b) and (e), does not believe in the practicability of (a) and (c) and deems (d), (f), (g) and (h) merely the expression of "Pious hopes" which as such, may be endorsed. The Deputy Commissioner, Upper Sind Frontier, writes that "The previous effort made in Sind in this direction, i.e., rural standards, was a complete failure and while the proposals now made are in theory excellent I do not feel there is much chance of putting them into practice". He holds that suggestions (d), (e), (g) and (h) are those that should be taken up first so as to ensure close touch between the countryside and the Educational and Agricultural Departments. The Collector of Nawabsháh thinks the resolution admirable in principle but that much will depend on their execution. He would devote one section of each Reader used in rural schools to "rural subjects" and

teach such lessons in the open air either in the school garden or the fields. But he is opposed to the restriction of the school course of rural subjects exclusively. He would have a separate body of teachers trained differently from the existing teachers.

6. Mr Lory, Educational Inspector, Central Division, rightly points out that a perusal of the synopsis of the Vernacular Readers will show that a large proportion of the lessons deal with rural or "natural" subjects and that village schools are by no means exclusively attended by agriculturalists. He is in favour of suggestions (a), (b) and (c) and would make nature study compulsory in training colleges and all schools with second year trained teachers. Every school should have a garden and grants for school gardening should be given. As regards (d) he accepts the principle but adds that full effect cannot be given to it at present. He accepts also (e) but does not consider separate training institutions for rural teachers feasible. The end desired, he suggests, might be gained by a system of alternatives in the courses of our District Training Schools. He accepts (f) subject to modification. As regards (g) he considers that suitable men from rural communities should be preferred for the inspecting staff but that men should not be selected simply because they belong to such communities. At the same time he lays stress on the necessity of recruiting as highly qualified graduates as possible for this purpose. He thinks that the Training Colleges should be brought into closer touch with primary schools and that their staffs should be recruited rather from the inspecting staff than from the ranks of High School teachers. In regards to the appointment of graduates in Science or Agriculture as Inspectors or District Deputy Inspectors he points out that what we require for these posts are men of all round qualifications and administrative capacity.

7. The general conclusions that seem to emerge from the above correspondence are :—

(i) That the revival of the direct teaching of agriculture or the old special rural standards in ordinary schools is neither necessary nor desirable :

(ii) That while a 'ruralization' of the courses in ordinary vernacular schools is desirable, at any rate in rural areas, it should not be carried to such extremes as to disgust the non-agriculturalist portion of the rural community with such schools or to deprive the agriculturalist altogether of possibilities of enlarging his horizon and his ideas of things other than local. For instance it should not entail the general exclusion of history and geography though it might render it advisable in some schools to convey information in these subjects through the reading series rather than by direct and separate lessons :

(iii) That, in spite of a certain volume of opinion on the other side, the creation for rural schools of a separate cadre or special teachers trained separately from other vernacular teachers and of a separate school course with separate text-books, even if desirable in itself (which is certainly open to doubt), is scarcely practicable under present conditions and those under which the Educational Department will have to work in the nearer future and would entail large expenditure which could probably be applied better in other ways. On the other hand a more liberal admixture in the teaching and inspecting personnel dealing with primary schools of men recruited from the genuinely agricultural classes is, within reasonable limits, desirable, as also is the inclusion in our "readers" of rural topics likely to appeal to and practically to benefit children in rural schools. At the same time it has to be recognised (a) that the countryside holds other occupants than mere agriculturalists, (b) that because a person by caste or occupation is not an agriculturalist he is not therefore necessarily out of sympathy with or unable to appreciate rural conditions, and (c) that, if certain recent researches in the Southern Division, are to be relied on, an unduly large proportion of the rustic population has no definite occupation at all and does only the very minimum of work (if any). Apparently important as agriculture is, it does not afford full-time employment to a large number of rural "hands," whose labour, therefore, should be available if necessary for other (e.g., industrial) purposes and whose outlook therefore should not be concentrated exclusively on the land. In view of these circumstances it would seem hardly wise to tie the rural schools to restricted courses and over-specialised text-books or too

severely to limit the personnel that deals with them for the benefit of particular interests and classes :

(iv) That gardens are very desirable adjuncts of rural schools, especially for the practical application of nature study, provided that they can be maintained without undue difficulties and expense and that they are properly laid out and used. The latter proviso postulates expert guidance and supervision for which we must look to the Agricultural Department unless we can have (as some other provinces have) a corps of educational officers specially trained in school-garden work and detailed as peripatetic teachers and inspectors or until our ordinary teachers and inspecting staff have had adequate training in this subject, which latter requirement presupposes that special instruction should be given in it at Training Institutions by competent instructors :

(v) That closer co-operation between the Agricultural and Educational Departments in matters pertaining to rural education is indicated. Separate training colleges for rural teachers are not, I think, essential but the Agricultural Department might be asked to advise upon particular schemes for Nature Study and School Gardening in use at the several existing training Institutions and to inspect the actual instruction (both theoretical and practical) given therein. It might also advise generally upon the alternatives in the courses of studies at Training Institutions which should be open to rural teachers. It must be remembered in this connection, however, that teachers passing out of the training schools and colleges are liable to serve under Municipalities as well as Local Boards and that a student cannot always tell whether his lines will fall in the town or country. One other way in which the Agricultural Department can materially assist would be to subject these lessons, in our vernacular reading series which deal with rural or nature-study topics, object lessons, and so forth, to a critical survey with the object of suggesting such corrections, additions, substitutions, or other improvements as it might find necessary or desirable. On the other side if (as seems very desirable) each district is to have its vernacular agricultural school, such schools may be used as training grounds in rural subjects for ordinary school teachers and the lower ranks of the Educational Department's inspectorate, men being deputed to such schools to study both methods and matter. It might also be possible for suitable teachers to be interchangeable between these schools and Local Board vernacular schools. Similarly interchanges between the Inspectorate of the Agricultural Department and the primary inspecting personnel of the Educational Department might also be tried.

8. Until the general lines of procedure are settled it is not easy to make particular recommendations. In this connection I venture to solicit reference to paragraph 6 of my No. 15722 of 5th February 1920, dealing with the question of 'wastage' in our primary schools. I have therein proposed that in the management of our vernacular schools and the shaping of their courses much more scope should be given than heretofore to 'local option' and that the instrument to hand for this purpose is the panchayat. If this proposal is approved the same general principle obviously applies to the questions now under consideration. In the event suggested, the country side after consultation with the Educational and Agricultural Departments would be enabled with certain general limits to decide for itself what it wanted to have taught in its schools. So far we have tried to dictate from outside and from above and the result has not been a conspicuous success. It seems time now to allow those most concerned (who, whatever else they may lack, are not devoid of shrewdness and common sense) to have not merely a voice in the discussion but also a hand in the execution in the matter. In no other way are we more likely to cultivate a living interest and to awaken a genuine sense of responsibility among those for whose benefit the schools exist.

9. Subject to my remarks in paragraph 8, I offer the following more specific suggestions :—

(i) Nature Study should be compulsory in all schools possessing a teacher trained in the subject. The provision of a garden is not a *sine qua non* for this purpose.

A Syllabus in school-gardening 'nature study for training schools and colleges' and also for primary schools have already been drawn up and sanctioned by Government. Arrangements are being made for the adaptation and translation of Thompstone's book.

(ii) The teaching of "the three R's" may be adapted in rural schools to the needs of rural life but should not be exclusively restricted thereto. This can best be done through the individual teacher (once he understands what is wanted) especially if he is exercised in such adaptation at his Training School or College. Separate syllabuses and a separate cadre of teachers are not essential. With the help of the Agricultural Department the Inspector of Training Schools might draw up a set of instructions for this purpose which should be useful not only for Training Institutions but for teachers after they have gone out into schools.

(iii) School gardens should be provided in places where land and water can be had without great cost, and provided that expert advice as regards laying out and maintenance can be made available. Rewards for useful and well kept gardens should be open for both teachers and pupils. The gardens should be cultivated with a view to producing grains, vegetables and fruits as well as flowers and specimens for nature study. Ceylon has an excellent system of school gardens and possibly a certain number of vernacular teachers and assistant Deputy Inspectors might be deputed to a course of study there. This experiment had been tried elsewhere.

(iv) Co-operation between the Agricultural and Educational Departments should be promoted, more particularly by the following measures:—

(a) Suitable officers of the Agricultural Department should visit Training Colleges and Classes and, after inspection, advise upon the instruction in nature study, school gardening and other subjects relating to rural life.

(b) The Agricultural Department should undertake a survey of the existing vernacular series of readers and make definite and detailed suggestions for their improvement in regard to the lessons dealing with nature study, object lessons, rural topics, etc., in order to render the books more suitable for rural pupils.

(c) Vernacular teachers and inspecting officers may be deputed to the Agricultural schools for purposes of study.

(d) Interchanges of teachers may take place between these schools and ordinary Local Board vernacular schools.

(e) Interchanges between the inspecting personnel of the two departments may also be tried.

(v) The personnel of the primary vernacular schools and of the inspecting agency that deals with them may be recruited as liberally as possible from the rural population always provided that suitable recruits are forthcoming and that selection is not confined to particular classes. It does not, however, seem possible to pledge the Department to any definite proportion.

(vi) Science or agricultural graduates may be welcomed on the inspection staff if they are competent to perform its necessary duties and are prepared to undergo necessary training in the Educational Department, which, if a man is to be a Deputy or Inspector, should include some experience in an Anglo-Vernacular School.

APPENDIX.

Resolution No. 10 passed at the Agricultural Educational Conference held at Simla on the 18th June 1917 and succeeding days.

The Conference accepts the principle that the text-books of primary schools be adapted to the rural environment of the pupil. They consider that, where necessary, the existing text-books should be revised by the Educational and Agricultural Departments in consultation, or that special text-books or syllabi should be prepared by them.

The Conference also strongly insists on the desirability of adapting primary education in rural areas more closely to rural needs. Whilst agreeing that no attempt should be made in primary schools to teach agriculture or horticulture as such, the following suggestions are made towards the solution of this problem :—

- (a) Nature Study should form a necessary part of the curriculum in rural schools.
- (b) All subjects—reading, writing and figuring—should be taught in relation to rural life.
- (c) A garden should be attached to each rural school as an aid to nature study, though lessons should also be given in the surrounding fields.
- (d) The teachers of rural schools should be recruited as far as possible from the rural population.
- (e) Special attention should be paid to the training of rural teachers, preferably in a separate training school for this purpose.
- (f) The Agricultural Department should, when opportunity offers, co-operate by vacation courses for such teachers.
- (g) The Educational Department should endeavour to recruit to the lower inspecting staff a larger proportion of the rural population.
- (h) The Educational Department should also endeavour to recruit as Inspectors or District Deputy Inspectors a larger proportion of science or agricultural graduates.

Discussion on Subjects Nos. 8 and 9.

The Hon'ble Dewan Bahadur Godbole said that he understood that many students from the Loni Agricultural School refused to take to farming and thought it below their dignity to work in the field. It was not proper that Government should give free board and lodging to such boys.

Rao Sáheb M. L. Kulkarni said that at the agricultural schools there were very few boys of the type mentioned by the Hon'ble Dewan Bahádur Godbole. The great majority of the students from the agricultural schools, after completing their course, went back to work on their fields, and are working there now. He stated that the school at Devi Hosur was a great success, and they had just had to reject 38 applicants for want of room.

Mr. Otto Rothfeld said that he had seen some of the agricultural schools and he thought that at this stage the concession of free board and lodging was necessary if students were to be secured.

Mr. G. Keatinge agreed with the last speaker and said that the present aim of Government was to establish one such school per district. The total cost of this scheme would only be about Rs. 2 lakhs a year. When they were approaching the ideal of one such school a district, they would certainly have to consider the question of cost before launching out into fresh expenditure of this kind, but he thought that at present there was no need for alarm at the expenditure.

Rao Bahádur Ambashankar U. Malji thought that these agricultural schools should be handed over to the Táluka Local Boards who understood local needs and conditions.

Sardár P. K. Biwalkar thought that there was no doubt regarding the utility of these agricultural schools. They were very necessary, and there should be one in each táluka.

The Hon'ble Rao Bahádur S. D. Garud said that agriculture should be introduced as an optional subject at all primary schools. This will save Government the cost of maintaining agricultural schools and those boys who want agricultural education can have it.

The Hon'ble Dewan Bahádur Godbole said that if you ask the boys in any village school what they intended to do, they would all say that they wanted to be clerks or something of the kind, and never that they wanted to return to their fields.

Mr. P. C. Patil agreed that this was so and said that what was necessary to find was some cure for this desire on the part of cultivators' sons to be clerks.

The Hon'ble Mr. B. S. Kamat suggested an agricultural school for each táluka.

Dr. Mann said that it was not that the Agricultural Department was unwilling to co-operate with the Educational Department but that the establishment of these separate agricultural schools seemed to be the only practical way to make a start in agricultural education. He thought, however, that the teaching in the ordinary primary school needed changing. If you asked cultivators why they did not keep their children at school beyond the 3rd standard, they would reply that if the children went further than the 3rd standard they would want to give up cultivation altogether.

The Hon'ble Mr. J. G. Covernton said that he did not think it possible to amalgamate general education and agricultural education. Under present conditions it was impossible to introduce agriculture as an optional subject in primary schools. It would mean introducing a lot of extra matter into the existing course. He referred to his printed note which gave his detailed opinions.

A resolution was then passed endorsing the suggestions made in paragraph 9 of the Director of Public Instruction's printed note.

Discussion on Subject No. 10.

“THE POSSIBILITY AND UTILITY OF ESTABLISHING DIVISIONAL BOARDS OF AGRICULTURE TO DISCUSS LOCAL PROBLEMS AND TO BE CONDUCTED IN THE VERNACULAR.”

Brief Summary of the discussion.

Dr. Mann said that this proposal originally came from the Indian Board of Agriculture. The Government of India had referred the proposal to the Local Government, who had put the matter before this Board.

Mr. P. C. Patil was against the proposal. He thought it doubtful whether any advantage would arise from Divisional Boards. Even Provincial Boards were still on their trial.

Dr. Mann thought that Divisional Boards would be very useful. Real agriculturists would come to them. There are many men who wish to take part in the improvement of agriculture, but there is no opening for them. Provincial Boards would provide such an opening.

Ráo Sáhib M. L. Kulkarni endorsed the views of *Dr. Mann* and was in favour of Provincial Boards.

Mr. V. G. Gokhale opposed the idea and said that at present there was no opening for Divisional Boards.

Mr. K. B. Bhadrapur was in favour of Divisional Boards on a linguistic basis.

The Hon'ble Dewán Bahádur Godbole said that each district had its distinct problems and proposed District Agricultural Boards held in the vernacular. He also suggested sectional Boards, e.g., a Board on potatoes in the potato growing tract of the Poona District.

Dr. Mann said that the unit for which the Board was held did not much matter, the great thing was to find out the problems of cultivators, and he was inclined to agree to the idea of sectional Boards dealing with particular crops.

Mr. G. Keatinge agreed as to the necessity of finding out the difficulties of cultivators, but thought that this could best be done in their own villages. Holding a number of formal Boards would take up a lot of the time of the staff.

The Hon'ble Mr. G. S. Curtis said that in Northern India Divisions were only about half the size they were here. Proposals had been made for Divisional Boards, District Boards and Sectional Boards. He proposed to put all three proposals to the vote.

Voting took place as follows:—

	<i>For</i>	<i>Against</i>
(1) Divisional Boards	..	11
(2) District Boards	12	..
(3) Sectional Boards	7	12

The proposal to hold District Boards was declared to be carried.

Subject No. 11.

NOTE ON THE FUTURE ORGANISATION OF THE WORK OF THE
AGRICULTURAL ENGINEER.

A proper survey of the work of the Department for the past 7 or 8 years will clearly show that the necessity for an elaborate establishment was never felt so keenly as now. The main functions of the Department are to test the different kinds of labour saving devices and agricultural implements, principally appearing on the market and to report on their suitability for agricultural purposes in India. Establishment proposals were therefore put up from time to time as the

demand for the various works in the Presidency arose and I have endeavoured to give as much attention as possible to this particular class of work. Consequently many suitable changes have been made.

The work of the Department has developed rapidly since the year 1915. The great rush of work owing to the war and famine totally changed the aspect of the Department. Nearly all experimental works therefore had to be stopped and all hands were required in the execution of new works. The applications from cultivators for ordinary tube wells and deep well bores began to pour in from all parts of the Presidency. In order to meet the increasing demand from the public additional boring machines were purchased and new men had to be trained for the work. Properly qualified men, however, not being available in time some of the cultivators were very disappointed as men and machines were not to be had for their works. Similarly new pumping plants and engines were purchased and erected at several places to relieve the famine conditions. Moreover, the Mesopotamia work brought additional heavy burden on the already insufficient staff which completely exhausted them. Several proposals have been sent at various times for additional staff but only a few posts have been sanctioned and the rest were not considered although there was a pressing need for them.

As a result of all this the members who were only few in numbers and much exhausted had hardly time to attend to the detailed accounts of works and cash expenditure which gave rise to some of the irregularities pointed out by the Accountant General, in his last inspection report.

In the interest of the work in the Presidency, stock is required to be kept at several places to meet the urgent demands of the work. The Accountant General has now pointed out the necessity of keeping detailed account of receipts and issues of the stores. The Government also desire that the plants and machines purchased for the Department should be given to the cultivator on hire and revenue thereof should be collected. The objects are no doubt very sound and can be easily achieved provided a sufficient number of clerks and executive subordinates are placed at the disposal of the Department. The Government were good enough to create an accountant's post for the accounts work of the office. But he has not been able to do any appreciable amount of work for want of clerical staff to assist him and also for want of executive staff for supplying him with the details of transactions regularly every month.

For a systematic work of the Department it is now quite essential to establish proper divisions in the Presidency under the control of each Divisional Officer as suggested by the Accountant General. To facilitate prompt execution of work and also speedy inspection thereof six divisions in the Presidency are proposed for pumping, boring and steam ploughing Departments as per statement attached. A comparative statement of proposed and existing staff is included for ready reference.

The necessity for the proposed staff is explained in the following paragraphs :—

Establishment for the Agricultural Engineer's Office.

1. *Agricultural Engineer.*

2. *European Assistant.*—It is not possible for one officer to look after the affairs of the whole Presidency, and this difficulty has already been perceived by the Director, *vide* his remarks in the Administration Report, 1918-19. A separate report in this connection has already been made as per this office No. 8099, dated 30th December 1919.

3. *Native Assistant.*—This post is a sanctioned one and was created with the object of training a native of India for the post of Agricultural Engineer in other provinces in India and it will be in the interest of the Department to continue the post and his assistance will be of great value for the administrative work in future.

4. *Boring Overseer.*—The post was created as soon as the Department began to undertake boring work and this subordinate is overburdened as the applications for the boring work are pouring in continuously.

5. *Boring Inspector*.—This is a new post and it is proposed solely to give the necessary help to the Boring Overseer in the inspection of works so that he may utilise most of his time for the more important work in the Presidency.

6. *Assistant Mechanical Superintendents*.—One subordinate is proposed for attending to purely technical work in the office and to give general assistance to the Agricultural Engineer and his Assistants.

7. Instructor to the oil engine and boring class with one fitter.

8. One Accountant for the account work and general management of the office. He is also required to conduct the audit and inspection of the Divisional Offices as often as possible in the year. This post has already been sanctioned by the Government.

9. *One Deputy Accountant*.—Whenever the Accountant will be touring in the Presidency on inspection work, it is quite essential to have a responsible subordinate for the accounts work in the office. Such posts are already existing in Public Works Offices and Treasuries where large amount of cash transactions are taking place. This office is required to spend nearly a lakh and a half in a year and the post is quite essential.

10. *Head Clerk*.—The post is a sanctioned one and his work and responsibilities will increase greatly after the creation of divisions in the Presidency.

11. *Clerks*.—There are only four clerks sanctioned for the office and the present work in the office is being cleared by them with great difficulty and by the creation of Divisions the work in the office will enormously increase and the following clerical staff is proposed in the place of existing sanctioned strength.

(a) *Senior Clerks* :—

- 1 For salary bills.
- 1 For travelling allowance bills.
- 1 For audit of stores accounts.
- 1 Typist.
- 1 Record Clerk.
- 1 General Clerk.

(b) *Junior Clerks* :—

- 2 For audit of Divisional cash account.
- 1 For store account.
- 2 Copying clerks.
- 1 Inward clerk.
- 1 Despatch clerk.

12. *Draftsman*.—The post is already sanctioned.

13. *Assistant Draftsman*.—The present tracer's post is proposed to be converted into an Assistant Draftsman's post.

14. *Surveyor*.—There is no subordinate for making surveys of any new projects. The post is absolutely necessary and proposals for the same have already been made to the Director of Agriculture on several occasions.

15. *Menial Staff*.—One Naik, and four peons and one Khalashi already sanctioned are quite inadequate and the proposed establishment is required for the purposes mentioned below :—The existing has been included in figures shown below :—

- 1 Naik.
- 2 Peons for the personal use of the Agricultural Engineer.
- 1 For the European Assistant.
- 1 For the Native Assistant.
- 1 For the Boring Overseer.
- 2 For office use.
- 1 Khalashi for sweeping office and one Khalashi for Treasury work.
- 2 Tapalees for local delivery and 1 chowkidar.

Establishment for Store.

1. Assistant Mechanical Superintendent for the general management of stores including accounts work.
2. Two Assistant Store-keepers, one of them will attend to station duty and the other will look after the receipts and issues of materials in the store. Pay Rs. 60-4-100.
3. One Senior Clerk and one Junior Clerk for keeping account of stores as the transactions take place everyday. The existing Store Clerk will be converted into Senior Clerk.
4. One peon for office work and one Khalashi.
5. Two chowkidars for watching the stores day and night.

Establishment for Workshop.

1. *Assistant Mechanical Superintendent.*—The present post of Workshop Superintendent is proposed to be converted into an Assistant Mechanical Superintendent. The subordinate will solely be in charge of petty works going on in the workshops, and as he will have the advantage of referring to the office a junior post is proposed.
2. Two chargemen for instructing and taking work from the labourers both skilled and unskilled in the workshop and outside.
3. One senior clerk and one junior clerk for maintaining workshop account and preparing bills of costs of each work done in the workshop.
4. Three boring fitters to attend to the urgent repairs of boring machines.
5. One Boring Inspector and other staff as per statement.

Oil Engine and Boring Class.

One Instructor* to be in charge of the class for giving instructions to the students regarding the Oil engines and Boring machines. It is not possible for the department to get trained men unless such an institution is opened.

Divisions for Pumping and Boring Departments.

It is proposed to open six divisions in the Presidency for pumping, boring and other works under each Divisional Superintendent and Assistant Boring Overseers and the staff for each division will consist of the following men :—

1. One Superintendent for the proper control and management of work in the division.
2. One Assistant Boring Overseer to attend to boring work in that division.
3. Two Boring Inspectors to assist the Assistant Boring Overseers in supervising works.
4. Three fitters for carrying on repairs, etc., to the pumps and engines owned by the Government as well as by the agriculturists.
5. One senior clerk for accounts work, one junior clerk for stores and two junior clerks for correspondence work.
6. Three peons, 1 khalashi and 1 chowkidar for the office.

The existing places of Mechanical Superintendents, viz., Mechanical Superintendent, 1st grade, other Mechanical Superintendents, Pumping Overseer will be converted into the post of Divisional Superintendents in the proposed new scheme. There are already three Divisions of the Boring Department under each Assistant Boring Overseer. Owing to the increase of work it is proposed to create three more divisions.

Steam Plough Department.

There is already a sanction for one Steam Plough Overseer, one canvasser, six drivers, one fieldman, four oilmen, four ploughmen, one peon and one chowki-

*This is included in the office staff.

dar for carrying on Steam Plough operation. The only changes made in the new proposals are the designation of the Steam Plough Overseer is changed into the Assistant Mechanical Superintendent, one senior clerk and one junior clerk are proposed for the accounts and correspondence work and one more chowkidar is proposed to guard the tackle. The proposed new posts are quite essential for the accounts work as the accounts are to be kept in detail in future.

In addition to the above permanent posts some temporary posts are necessary and they are required to be engaged according to current demands. These men will be engaged by charge to contingencies and their cost will be subsequently charged against the works for which their services will be utilised. Therefore a formal sanction to the entertainment of the posts will be quite sufficient.

		Rs.
Fitters	on pay from	.. 40 to 60
Drivers	do. ..	.. 40,, 60
Carpenters	do. ..	.. 40,, 60
Masons	do. ..	.. 40,, 60
Smiths and Moulders	do. ..	.. 40,, 60
Turners	do. ..	.. 40,, 60
Mechanists	do. ..	.. 30,, 50
Boring Mucadams	do. ..	.. 30,, 70
Trained coolies	do. ..	.. 20,, 30
Hammermen and Blower boys	do. ..	.. 15,, 20

Reasons for the proposed Increase in Salary.

In the whole of the Presidency there is a general cry about the insufficiency of pay of Government servants and proposals for the revision for the scale of pay are being put forth for the orders of Government by all departments. Keeping in view the proposals drafted by several departments the following proposals are made for this Department:—

1. Agricultural Engineer. } These two places being of Imperial line to be
2. European Assistant. } dealt with separately.

Pay Rs. 500-50-1,000, based on Imperial Grade of Assistant Engineer in Public Works Department.

3. *Native Assistant to the Agricultural Engineer.*—This post was originally created on Rs. 150-10-200, by Government in Government Resolution, Revenue Department, No. 8797 of 24th September 1912, with a view to train a Native of India for the Agricultural Engineer's post. Mr. Paranjpe was accordingly appointed to the post and he has completed five years' probationary period some two years back and is now quite able to take charge of the Agricultural Engineer's post of any province.

He is for the present working as Personal Assistant and carrying on all the duties of the Agricultural Engineer. He was recommended to act as Agricultural Engineer during the last vacancy by the Director of Agriculture and also by myself. Mr. Thiselton-Dyer was nominally appointed to take charge of the office and Mr. Paranjpe had to run the whole work of the Department for which Government was pleased to sanction duty allowance of Rs. 75 per mensem for the period. It is therefore proposed to increase his pay to Rs. 350-35-700 as he has enormous work to do and also the cost of living has greatly increased during the recent years. The suggested grade is based on the salary of the Assistant Engineer, Public Works Department, on Provincial Grade which is Rs. 300-40-860.

4. *Boring Overseer.*—This subordinate is in charge of boring works going on in the Presidency including Sind and he has managed the work very skilfully up to this time. In consideration of work and high cost of living it is proposed to increase his pay to Rs. 200-20-500. The grade suggested is based on the pay of the upper subordinate first grade in Public Works Department which is Rs. 400, now capable of being increased by the new revision.

It will be in the interest of the Department if the above two posts are gazetted as these subordinates are required to repeatedly come in contact with District Officers and therefore it is quite essential to increase their local status in proportion to their pay.

5. *Divisional Superintendents.*—Pumping and Steam Plough Departments. In the proposed new scheme the Superintendent will have more responsibility and work to do than at present. It is therefore proposed to create these posts on Rs. 160-15-340 and the proposed pay is on the lines of the divisional superintendents in the proper Agricultural Department or 2nd grade upper subordinates in Public Works Department according to old scales. The pay of the Engineers in Private Mills is for the present nearly on the same lines, certainly not less.

Mr. Vaidya, Mechanical Superintendent, 1st grade, is a most senior man in the Department and to maintain his rank and seniority in the Department it is proposed to give him the benefit of three years' increment at once, in the new scheme so that his pay may amount to Rs. 205. He has worked very satisfactorily in the Department and he is well deserving of the proposed concession. If this is not allowable by rules I have to strongly recommend a special post of Rs. 205-15-340 as a Senior Divisional Superintendent.

6. *Assistant Mechanical Superintendents.*—These subordinates will have to do nearly all the work done by the Superintendents, but they will have not as much responsibility as these men will be junior subordinates, their pay is proposed on Rs. 100-10-150 which seems quite reasonable.

7. *Assistant Boring Overseers.*—As the work of these subordinates does not require high technical knowledge as the Mechanical Superintendents, it is proposed to have a different scale for these subordinates and their pay is proposed on Rs. 100-8-180. As compared to their work the pay is not much.

8. *Boring Inspectors.*—These places are similar to the Assistant Mechanical Superintendents but require less knowledge of Mechanical Engineering; therefore the post of Rs. 75-5-100 is proposed in the new scheme.

8a. Instructors to the Oil engine and Boring Class, pay Rs. 100-8-180.

9. *Fitters, Drivers, Boring Fitters.*—As the cost of living has greatly increased and also as there is great demand for these men everywhere it is very difficult to get good men on present scale of pay. Therefore it is proposed to increase their salary from Rs. 40-3-70 to Rs. 70-3-100 according to qualifications.

10. *Chargemen.*—In the new scheme it is proposed to engage two charge-men to give instruction to the skilled and unskilled labourer and to exact proper work from them. Their pay will be Rs. 60-4-100 as only men of long experience of work will be appointed for these posts. One will be posted at the Shops and other outside on erection work.

11. *Surveyor.*—It is proposed to engage a surveyor of the qualifications of sub-overseer in the Public Works Department and his pay will be Rs. 70-5-120.

12. *Canvasser Fieldmen.*—These posts are already sanctioned in connection with the steam plough operation. Owing to the present high cost of living it is necessary to increase their pay to Rs. 70-5-120.

13. *Draftsman.*—The place is already a sanctioned one and his pay is required to be proportionately increased to suit the scale of subordinates. His increment is therefore proposed for Rs. 90-5-130.

14. *Assistant Draftsman.*—This post is asked for in place of the existing tracer's post and the pay proposed is Rs. 60-3-90.

15. *Oilmen.*—These posts are already sanctioned and proposal of Rs. 15-2-35 is made on account of present high cost of living.

16. *Ploughmen.*—Increase of Rs. 20-2-40 for reasons stated above.

OFFICE ESTABLISHMENT.

1. *Accountant.*—In this office the Accountant is required to do the same work as the Accountants in the Public Works Department. The Public Works

Department Accountants have sent in Memorials to Government for increasing their pay to Rs. 200—20—400. The Accountant in this office, in addition to looking after the accounts work of the office, is required to inspect the divisional offices from time to time and it is proposed to give him a duty allowance of Rs. 50 in addition to the above pay.

2. *Head Clerk.*—The work of the Head Clerk will increase enormously after establishment of proper divisions in the Presidency. It is therefore proposed Rs. 150—5—200 for him as this will be in proportion to the additional work and also high cost of living.

3. *Deputy Accountant.*—A senior accounts knowing man will be necessary for the post and he will have to look after the accounts work when the Accountant goes on inspection duty. Therefore his pay is proposed for Rs. 125-5-150 which is quite reasonable as compared to responsibility.

4. *Senior Clerks.*—Persons of long experience of work in the Department should be appointed for the posts and hence their pay is proposed for Rs. 70—5—120 as these men will have to do more responsible work in the office.

5. *Junior Clerks.*—It has become very difficult to get men on existing starting pay in the Department as they cannot pull on with such small pay. Keeping in view their difficulty for living a scale of Rs. 40—3—70 is proposed.

Menial Establishment.

	Rs.	
Náik ..	18-1-25	It is very difficult for the low-paid menials staff to pull on within 8 or 9 rupees every month. A proportionate increase in their pay is also necessary and the rates proposed are reasonable if the cost of present living is taken into consideration.
Peons ..	15-1-20	
Chowkidárs ..	15-1-20	
Khalashi ..	12-1-15	
Tapali ..	12-1-15	

W. M. SCHUTTE,
Agricultural Engineer, B. P., Poona.

SCHEME No. I.

Serial No.	Heads.	Heads.														Senior Clerk and Typist 70-5-120.					
		Agricultural Engineer.	European Assistant 500-50-1,000.	Indian Assistant 350-35-700.	Boring Overseer 200-20-500.	Divisional Mechanical Superintendents 160-15-340.	Assistant Mechanical Superintendents 100-10-150.	Assistant Boring Overseer 100-8-180.	Boring Inspector 75-5-100.	Instructor to Oil Engine and Boring Class 100-8-180.	Assistant Store-keeper 60-4-100.	Workshop Charyaman 60-4-100.	Fitters, Junior and Drivers 40-3-70.	Draftsman 90-5-130.	Assistant Draftsman 60-3-90.		Surveyor 75-5-120.	Canvasser 70-5-120.	Accountant 200-20-400.	Head Clerk 160-5-200.	Deputy Accountant 125-5-150.
1	Agricultural Engineer's Office.	1	1	1	1	..	1	..	1	..	..	1	1	1	..	1	1	1	1	1	6
2	Agricultural Stores.	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	1
3	Do. Workshops	..	..	..	..	..	1	..	1	..	..	..	..	..	..	..	..	..	..	..	1
4	Oil Engine and Boring Class.	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..
5	Steam plough	..	..	..	..	..	1	..	..	..	..	6	..	..	..	1	..	..	..	..	..
6	Division No. I	..	..	..	..	1	..	1	2	..	..	..	..	1	..	..	..	..	..	..	1
7	Do. No. II	..	..	..	..	1	..	1	2	..	..	..	..	1	..	..	..	..	..	..	1
8	Do. No. III	..	..	..	..	1	..	1	2	..	..	..	..	1	..	..	..	..	..	..	1
9	Do. No. IV	..	..	..	..	1	..	1	2	..	..	..	..	1	..	..	..	..	..	..	1
10	Do. No. V	..	..	..	..	1	..	1	2	..	..	..	..	1	..	..	..	..	..	..	1
11	Do. No. VI	..	..	..	..	1	..	1	2	..	..	..	..	1	..	..	..	..	..	..	1
	Proposed strength.	1	1	1	1	6	4	6	14	1	2	2	13	1	1	1	1	1	1	1	14
	Present strength...	1	..	1	1	5	1	3	..	..	..	..	13	1	1	..	2	1	1	..	6
	Increase	..	1	..	..	1	3	3	14	1	2	2	..	..	..	1	..	..	..	1	8

Serial No.	Heads.	Temporary Establishment (Non-pensionable).																				
		Junior Clerks 40-3-70.	Naik 18-1-25.	Peons 15-1-20.	Chowkidars 15-1-20.	Khalashies 12-1-15.	Tepalies 12-1-15.	Oilmen 15-2-35.	Ploughmen 20-2-40.	Fitters Senior 70-3-100.	Turners 40 to 60.	Smiths 40 to 60.	Carpenters 40 to 60.	Masons 40 to 60.	Moulder 40 to 60.	Hammer-man 20 to 30.	Blower boys 15 to 20.	Boring Mechanics or Borers 30 to 70.	Trained apprentices 20 to 30.	Fitters 40 to 60.	Coolies 13 to 25.	Mechanists 30 to 50.
1	Agricultural Engineer's Office.	7	1	7	1	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
2	Agricultural Stores.	1	..	1	2	1	..	..	..	..	..	2	..	..	..	..	..	..	..	..	6	..
3	Do. Workshops	1	..	1	..	1	..	2	..	3	4	3	2	3	1	4	3	..	6	4	10	4
4	Oil Engine and Boring Class.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..
5	Steam plough	2	..	1	1	..	1	4	4	..	1	..	..	..	1	1	..	2	..	2	2	..
6	Division No. I	3	..	3	1	1	..	..	..	2	1	..	..	..	1	1	20	2	..	2	2	..
7	Do. No. II	3	..	3	1	1	..	..	..	2	1	..	..	..	1	1	20	2	..	2	2	..
8	Do. No. III	3	..	3	1	1	..	..	..	2	1	..	..	..	1	1	20	2	..	2	2	..
9	Do. No. IV	3	..	3	1	1	..	..	..	2	1	..	..	..	1	1	20	2	..	2	2	..
10	Do. No. V	3	..	3	1	1	..	..	..	2	1	..	..	..	1	1	20	2	..	2	2	..
11	Do. No. VI	3	..	3	1	1	..	..	..	2	1	..	..	..	1	1	20	2	..	2	2	..
	Proposed strength.	29	1	28	10	10	3	6	4	15	4	10	4	3	1	11	10	120	20	4	31	4
	Present strength	..	1	8	2	1	..	4	4	8	1	1	2	3	..	..	..	50	6	4	..	..
	Increase	29	..	20	8	9	3	2	..	7	3	9	2	..	11	10	70	14	..	31	4	

Discussion on Subject No. 11.

Mr. Schutte stated that he had submitted a printed note on this subject. He must have an increase of staff if his work was to expand and be of general use to cultivators. Scheme No. 1 showed his maximum requirements during the next few years, while another scheme which he had submitted showed his immediate and minimum requirements for staff, which covered seven new posts and some subordinate staff. The seven posts were, a European Assistant Engineer, an instructor for the oil engine and boring classes, a surveyor, store-keeper, canvasser and two senior clerks. For this scheme he estimated the total cost to be about Rs. 1,686 per mensem. He gave figures showing how enormously his work had expanded and how large was the demand made by the public for advice and assistance. Scheme No. 1 provided for expansion all round. He proposed to set up a small Engineering Department in each division, equipped with tools and materials. A Divisional Superintendent would be in charge of each Depôt with the necessary technical staff of boring Inspectors, fitters, etc., and work would be disposed of direct from these Depôts and all the work would not come to Poona as at present. This would save a great congestion of work at Poona. In 1918-19 he spent Rs. 3,66,000 with only one accountant on Rs. 40 per mensem to do his accounts, and he now had stores on hand worth Rs. 5 lakhs, with only a store-keeper on Rs. 20 per mensem to look after them. He had hoped that the District Local Boards would relieve him of some of his work. Several of them had taken up boring, but they were unable to carry it on successfully. He thought that his branch had a good record of work done, but it had come to this that it must be either more staff or less work.

The Honourable Dewán Bahádúr Godbole said that it was a question whether some of the work now done by the Agricultural Engineer could not be undertaken by private agency. Repairs to machinery, etc., were done by the Agricultural Engineer, both for departmental machinery and for machinery belonging to private persons. He suggested that private agencies might be induced to open workshops at places like Poona, Hubli, Ahmedabad, Nadiád or Karáchi, which would relieve the Agricultural Engineer of all this work. An initial subsidy from Government to such firms might be necessary in the beginning.

The Honourable Mr. B. S. Kamat said that he noted that the Agricultural Engineer was asking for a European Assistant and for an Indian Assistant. He asked whether two Indian Assistants would not do as well and save outlay.

Mr. Schutte replied that if relieved of this executive work his present staff was ample, but if he was to expand his executive work, viz., deep ploughing, boring operations, and the erection of pumping plants he considered that a European Assistant was essential. In reply to the Honourable Dewán Bahádúr Godbole he said that he would be very glad if private firms would take over his executive work entirely, leaving him to do experimental and advisory work, but he did not think that he could be responsible for extensive executive work in the field if all his repair work was to be done for him by the suggested agencies, and he was to have no workshop.

Ráo Sáheb Dadubhai Desai thought that a great extension of the work of the Agricultural Engineer was desirable, and would like to see a separate Agricultural Engineer for each charge now held by a Deputy Director, with a Chief Agricultural Engineer at Poona to supervise them.

Mr. Thiselton-Dyer thought that the work of the Agricultural Engineer wanted careful overhauling. The Agricultural Engineer had large numbers of men on low pay working in many parts of the Presidency under very little supervision and he did not think that this was suitable. He thought that the scope and limits of the work wanted to be clearly defined and suggested that a suitable committee be called for the purpose.

Mr. G. Keatinge said that if private agency could be found to do work now done by the Agricultural Engineer, it would be a very good thing, but could any one say where such agency was to be found. It must be remembered that it was found necessary in the beginning to have an Agricultural Engineer to advise and

assist the public in Agricultural Machinery, because it was found that some firms were giving such bad advice to the public on these subjects.

The Honourable Dewán Bahádur Godbole said that he believed that suitable firms could be found to do some of the work.

The Honourable Mr. G. S. Curtis said that there were various opinions on the subject and he thought that the matter needed discussion by special Committee, as had been suggested.

Subject No. 12.

NOTE ON COTTON SALE SOCIETIES.

These societies have not been started with a view to encouraging co-operation. They have been started to help the Agricultural Department in its task of satisfying the international capitalist market by giving them a purer Indian cotton. It is, however, also a secondary object to try, if possible, to secure for the cultivator, by co-operative combination, a fairer share of the prices allowed by the international market, that is to say, the price with a smaller deduction for the local middleman's profit.

2. The main object cannot be realized unless (a) a pure strain is maintained, and (b) adulteration is avoided. Neither of these conditions, however, can possibly be attained unless the big buyers are prepared (1) to take some trouble to secure pure and unadulterated cotton and (2) to pay a proportionately higher price for it. The facts, however, are that the big buyers refuse to take any trouble at all and that they do not pay a commensurately higher price. They content themselves with writing letters to the papers and so on. Their real idea is that other people—Government by preference—should take the trouble on their behalf and that the cultivator should produce better cotton for them at the same price that they pay for worse, thereby increasing their profits but leaving the cultivator actually worse off. However, for various reasons, Government and the Agricultural Department, are apparently committed to helping the cotton merchants, so one can only note the fact that the latter do not help themselves.

3. It is believed that the Cotton Sale Societies have done a good deal to secure the conditions noted above. To a slight extent they have also increased cultivators' profits at the expense of the middlemen and to a very slight extent indeed—if at all—by getting a little better price for higher varieties. They have done nothing to increase the co-operative spirit. It is indeed a question whether they have not harmed it by inducing dependence on experts and on a small Committee or a Chairman, usually consisting of renegade middlemen.

4. A principle of compulsion has been introduced which is quite wrong and harmful. Neighbouring Credit Societies have been induced to force borrowing members to sell their cotton through the Cotton Sale Society as a condition to getting loans. This ruins the co-operative spirit, destroys the Credit Society and only serves to prop up a Cotton Sale Society whatever its faults may be, instead of compelling it to succeed by manifesting its advantages to members. The system must be stopped. Four Cotton Sale Societies have actually gone further and are at great risk to themselves lending money to Societies on similar conditions. It is hardly conceivable that this was ever allowed but it does actually go on.

5. An absurdity arising from the unco-operative nature of these Societies is that although their turn-over is 2 or 3 lakhs each, they yet ask for all sorts of exemptions and favours from Government. For instance, some have suggested that they should escape altered assessment of a few rupees; another actually had the impudence to ask the Registrar to secure the grant or loan of a couple of thousand from Government for a building, though the members could have raised this by the deduction of a minute fraction of an anna per rupee on the prices realized. In no single Society have members made any attempt to bank any part of their large profits so as to avoid the necessity of advances in the next year.

6. These unco-operative practices will have to be stopped in the interests of the movement, unless cause is shown for winking at them for another year in the interests of the large cotton buyers. But in that case the buyers should be asked to state definitely whether they want these societies and will promise to buy from them direct.

7. Minor improvements required are, (1) study of the Berar system, (2) weigh bridges, (3) training of managers. Special facilities in the way of remission of assessments, etc., are not required.

OTTO ROTHFELD,
Registrar,
Co-operative Societies.

Discussion on Subject No. 12.

Mr. Otto Rothfeld said he had had an opportunity of discussing the subject that morning with the Honourable Mr. Purshotamdas Thakurdas, and wished to modify some of his statements in his Note. He recognized that, there were some large merchants and buyers who did sympathise with the cultivators and their difficulties in selling cotton. He would, however, like to invite the attention of the Board to paragraph 4 of his Note, and to ask their opinion on the matter.

The Honourable Mr. G. S. Curtis.—It is purely a Co-operative question and not an Agricultural one.

The Honourable Mr. Purshotamdas Thakurdas expressed the opinion that paragraphs 1 and 2 of Mr. Rothfeld's Note contained an entirely wrong view about the attitude of the cotton trade. He reviewed the circumstances of the Cotton Frauds Act of 1880, and said that the agitation then was made with the object of getting pure cotton on the market. The present movement against indiscriminate cotton mixing is in the interest of the cultivators who must lose heavily by the practice and are now losing heavily. He said that in a popular movement they must expect such demands as those referred to in paragraph 5 of the Note. Referring to paragraph 6 of the Note he said that the matter was not one for the buyers at all. They cannot bind themselves to buy from any particular society.

Rao Sáheb M. L. Kulkarni said that he agreed with paragraphs 1 and 2 of Mr. Rothfeld's Note. Buyers of cotton sympathised little with the growers of cotton. They will not pay for long-stapled cotton. If they are ready to guarantee a premium for long-stapled cotton, it will be grown. If not, it may easily die out altogether.

The Honourable Mr. Curtis said that he did not think that any Resolution on this subject was possible, and declared the Board meeting to be at an end.