

Department of Agriculture, Bombay.

BULLETIN No. 59 OF 1914.

COMMON SALT AND ITS USE AS MANURE IN THE  
KONKAN DIVISION.

BY

VENKANNA HOSABNAIK GONEHALLI, M.A. (CANTAB.), ETC.,

*Extra Deputy Director of Agriculture, Konkan Division.*



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 DEPUTY DIRECTOR OF AGRICULTURE, KONKAN  
 DIVISION.

CHAPTER I.

INTRODUCTORY.

In my tours in Thána, Kolába, Ratnágiri and Kánara, I have made enquiries regarding the use of common salt for agricultural purposes and have found that there exists throughout the Konkan a considerable demand for salt for manure.

2. In Salsette in the Thána District I know several landowners who use salt every alternate year for grafted mango trees at the rate of two páylis, *i.e.*, 10 lbs. per tree. At Kelva-Máhim, some garden owners apply salt to cocoanut trees. In Murbád and Bhiwndi Tálukas salt is not used for manuring purposes. At Uran in the Kolába District, it is applied to mango grafts and cocoanut trees.

3. In the northern tálukas of the Ratnágiri District, some landowners use salt for cocoanut and mango trees. A gentleman of Dabhol applies 10 lbs. of salt to each cocoanut or mango tree in alternate years. It is the practice in certain places to apply salt to mango trees that do not bear flowers. The opinion of the people is that as the result of the application of salt such trees come into bearing. I know an educated landowner at Ratnágiri who observes the following rotation in manuring his cocoanut and mango trees :—

1st year	...	...	... Cattle manure.
2nd year	...	...	... fish manure ("kutti").
3rd year	...	... salt	(10 lbs. per tree).

4. I find that the demand for salt for agricultural purposes is more keen in Vengurla Táluka than anywhere else in the Konkan. The people of that táluka complain that they are prevented from scraping salt-earth and using it for manuring purposes. The keen demand of the people of Vengurla Táluka for salt is no doubt based on the practice of cultivators in Goa. There is no tax on common salt in Goa and it is largely used as manure for cocoanut and mango. The Goanese cultivator also applies salt in the fair

season to "barad" rice lands, which grow early varieties of sweet rice and correspond to "kuryat" or "makki" lands of Ratnágiri and Kánara. The opinion of the cultivators of Goa is that the application of salt to "barad" lands increases the outturn of rice. In Goa, small doses of salt are also applied to lemon and jack-fruit trees. In Vengurla Táluka, the people use, even at present, certain quantities of salt for manuring cocoanut and mango, though the price they have to pay for duty-paid salt comes in the way of its extended use.

5. In Kánara, too, the people complain that they are not allowed to scrape salt-earth and use it for manuring cocoanut trees. The people of Avarsa in Ankola Táluka and other villages have repeatedly applied to this Department for making salt available for using it as manure.

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## CHAPTER II.

### POPULAR DEMAND FOR SALT FOR MANURE.

6. At the Agricultural Conference held in Poona in September 1909, it was urged that duty-free salt should be issued to cultivators in the Konkan for manuring cocoanut and mango trees.

7. In the issue of the Satya Shodhak, a Maráthi weekly paper of Ratnágiri, dated 10th October 1909, a reference was made to the speech of the Honourable Sir John Muir-Mackenzie at the Agricultural Conference above alluded to, and it was pointed out on behalf of the cultivators of the Ratnágiri District that they should be provided with cheap salt for manuring purposes. The then Collector of Ratnágiri brought this to the notice of the Director of Agriculture. On a reference being made by the Director of Agriculture, the Collector of Ratnágiri wrote in February 1910 that salt and salt-earth were used to some extent in his district as manure for mango grafts, lemon and other garden fruit trees in addition to cocoanut trees, that they were also used at times to prevent white ants and other insects damaging young plants, and that any scheme which would facilitate the use of salt for the purposes of manure would certainly be appreciated by the agricultural population.

8. In paragraph 9 of Government Resolution, Revenue Department, No. 7515, dated 22nd August 1910, reviewing the proceedings of the Conference above referred to, Government called for a report on the arrangements that might be made to allow cultivators to take salt and salt-earth free of tax to manure cocoanut and mango trees.

9. In March 1910 the Director of Agriculture pointed out to the Collector of Salt Revenue that salt and salt-earth were required by the cultivators on the coast as a good manure for cocoanut trees and also for mangoes and that there were difficulties in the way of their obtaining them on account of the regulations preventing their removal; and enquired whether it would be possible to devise a system which would enable cultivators to get salt and salt-earth for manure, without affecting the salt revenue and pointed out that it would be worth taking some small risk in the matter in order to remove what appeared to be a genuine grievance and that the risk would be small.

10. In June 1910, the Dnyan Prakásh of Poona published an extract from the Satya-Shodhak of Ratnágiri, alleging that one Mr. Vishnu Umaji Parab of Shiroda, Vengurla Táluka, removed from his assessed lands salt-earth for manuring his cocoanut trees, that the Sarkárkún of Shiroda prosecuted Mr. Parab under section 4 of the Salt Act and that the Magistrate convicted the accused and sentenced him to pay a fine of Rs. 5.

11. The Director of Agriculture sent me a copy of the extract above referred to and asked me to enquire during my trips in the Konkan :—

(1) What trees or crops good cultivators say that salt is good for, and

(2) Whether people complain of not being allowed to scrape salt incrustation off their fields.

12. In March 1911, I submitted my report, describing the extent to which salt and salt-earth were used for manuring purposes throughout the Konkan and showing the opinions of intelligent cultivators regarding their utility as manures.

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### CHAPTER III.

#### DENATURALISATION OF SALT.

13. In reply to the Director of Agriculture's enquiry, the Collector of Salt Revenue wrote that it would be inadvisable to allow the use of salt-earth as manure, as it would be impossible to exercise any check over the process; that there would be great danger of misuse of the same for curing fish for the up-country market; that it had long been the endeavour of the Salt Department to stamp out a process which but imperfectly cured the fish and produced a deleterious article of food; and that it would be inadvisable to go back on that policy. He also drew attention to the general

permission granted in Government Resolution, Revenue Department, No. 9695, dated 24th October 1910, to allow the use of salt-mud or sand for manure subject to regulation by the Commissioner of Customs, Salt, Opium and A'bkári. As regards the proposal to mix salt with some material in order to denaturalise it and thereby make it unfit for human consumption, the Collector of Salt Revenue suggested that the salt to be issued for the purposes of manure should be denaturalised with coal tar; that the existing Salt establishment should be employed as distributing agency; that denaturalised salt should be made obtainable at fish-curing yards and salt works; that the Salt Department should undertake the denaturalisation; and that the salt should be issued at the same price as fish-curing yard salt *plus* cost of denaturalisation or say at 10 annas a maund.

14. In May 1911 the Collector of Salt Revenue sent a sample of 5 seers of salt mixed with 10 tolas of coal tar to Dr. Mann, Agricultural Chemist to Government, who reported that he had no difficulty in preparing edible salt from the sample received by him. Then the Collector of Salt Revenue enquired whether the Agricultural Chemist could suggest any more efficient method of denaturalising salt than that which could be so easily overcome. Dr. Mann recommended nightsoil and cattle manure or urine as possible materials for denaturalising salt with them. As regards cattle manure, he thought that one to five per cent. of it ought to be a fairly efficient protection. The Director of Agriculture held that the use of nightsoil would prevent the people from using the salt and so would defeat the object of denaturalising it and suggested the use of cattle manure for denaturalising salt, to which the Collector of Salt Revenue agreed.

15. In September 1911, the Director of Agriculture instructed me to take delivery of samples of salt denaturalised with five per cent. cattle-dung from the Sarkárkún of Mátunga and submit it to intelligent cultivators and obtain their opinion as to whether it was likely to suit their requirements.

16. I obtained half a maund of salt denaturalised with five per cent. cattle-dung from the Mátunga salt works and submitted samples of it to intelligent cultivators in all the four districts of the Konkan. Their opinion was very favourable and they agreed that the denaturalised salt would meet their requirements. I toured in the Ratnágiri District and personally showed samples of the denaturalised salt to a good number of agriculturists at Ratnágiri and Vengurla. The enthusiasm of the people about the privilege to obtain salt at a concession rate for manuring purposes was nowhere so great as at Vengurla. I consulted the Pátíl of Redi,

the southernmost village in Vengurla Táluka, and het old me that his relatives at Keri, Manjre, etc., on the other side of the frontier in the Goa territory used salt as manure for nágli, rice, cocoanut, mango and jack-fruit.

17. In January 1912, the Collector of Salt Revenue sanctioned the issue of 100 maunds of denaturalised salt at eight annas per maund from the Mátunga salt works. A similar quantity was promised to be issued from one of the fish-curing yards in the Ratnágiri District at 7 annas per maund exclusive of charges for denaturalising salt. The Collector of Salt Revenue also wrote that if the experiment was successful he would endeavour to obtain salt from the Mátunga salt works at a cheaper rate and move Government to sanction the issue of duty-free salt for manuring purposes from the Mátunga and Uran salt works and the fish-curing yards in the Ratnágiri and Kánara Districts.

18. The total quantity of 200 maunds of salt was issued in May 1912—100 maunds from the Mátunga salt works and 75 and 25 maunds from the Vengurla and Ratnágiri fish-curing yards, respectively. This quantity was partly utilised for my experiments on cocoanut, mango and rice and partly distributed to suitable cultivators who could be trusted to use the salt properly for manure.

19. A sample of salt denaturalised with 5 per cent. cattle dung was sent to the Chemical Analyser to Government, who reported that he recovered 96 per cent. of pure sodium chloride from the original sample by solution in water and ordinary filtration. The Collector of Salt Revenue, therefore, intimated to this Department that he could not issue any more salt denaturalised with cow-dung for manuring purposes, and expressed his doubts as to whether there was any real necessity for issuing denaturalised salt for manuring purposes, since the demand was mainly from the Coast Districts where under Government Resolution, Revenue Department, No. 9695, dated 24th October 1910, a general permission to take salt-mud or sand had been granted under certain conditions. He also enquired whether that concession did not meet the demand for the Coast Districts.

20. I was asked to report on the issues raised by the Collector of Salt Revenue, and from the report submitted the following may be extracted :—

“ The price of one maund of ordinary duty-paid Calcutta salt at Uran which is not denaturalised is about Rs. 1-4-0, which includes Re. 1, as duty on salt. It contains 97·2 per cent. of sodium chloride, whereas salt-mud and salt-earth contain 3·5 and 6·5 per cent. of sodium chloride, respectively.



“ Under Government Resolution, Revenue Department, No. 9695, dated 24th October 1910, a general permission has been granted to take salt-mud (Khari Chikal) and sand (Reti) and not salt-earth (Khari mati). The sand referred to in the Government Resolution contains very little saline matter. If we take sodium chloride as the active manurial ingredient of salt, we should then admit that one maund of salt is equivalent to 27 maunds of salt-mud or 15 maunds of salt-earth. The bázár price of one maund of duty-paid salt would be far exceeded by the cost of collecting and transporting 27 maunds of salt-mud or 15 maunds of salt-earth to a village, say, 4 miles distant from the sea or creek. It is not that salt-mud and salt-earth are available in each and every village where salt is required for manuring purposes. It seems to me that the concession already granted in the Government Resolution referred to is not likely to meet the demand for salt for agricultural purposes in the Coast Districts.

“ What the Chemical Analyser has shown is that salt can be prepared by dissolving the denaturalised material in water and evaporating the solution and not that the denaturalised salt is itself edible. If the people are supplied with salt in its natural condition, they will certainly use it for other than manuring purposes. But it seems to me that there are certain considerations which will deter the people from manufacturing salt from the denaturalised material. The cost of evaporating the solution, the present cheapness of salt in the market and above all the fear of detection will all strongly operate against any illicit use of the denaturalised salt.”

21. The Collector of Ratnágiri, too, reported to the Director of Agriculture that the concession granted in the Government Resolution above referred to would not adequately meet the case in his district, and pointed out that the demand for salt for manure was exceedingly keen, as was obvious from the fact that though only exceedingly short notice was given of the decision to issue as an experimental measure one hundred maunds of salt denaturalised with cow-dung at 7 annas per maund, applications were received during three weeks for 1,308 maunds of denaturalised salt. It was clear that the people applied without any idea that it would be possible to utilise the salt for other than manuring purposes.

22. The Director of Agriculture, therefore, brought to the notice of Government that the Divisional Inspector of Agriculture, Konkan, was supported by the Collector of Ratnágiri in the statement that there was a genuine demand for salt for agricultural purposes and that no other form of salt such as salt-earth or salt-mud could meet the cultivators' requirements.

23. Later on, in May 1912, I brought to the notice of the Director of Agriculture a new method of denaturalising salt and suggested that bone dust and black liquid fuel oil should be used as denaturalising materials. Bone meal is costly, but bone dust is cheaper. Again, the latter stinks more than the former. Ordinary kerosene oil costs about Rs. 1/12 for four gallons in bulk. But the price of the same quantity of black liquid fuel oil is only one rupee. Kerosene oil does not smell so much as fuel oil. Bone dust is in itself a fertiliser and anything mixed with it is obnoxious to Hindus. Salt denaturalised with 5 per cent. bone dust and one per cent. black liquid fuel oil gives out such a bad smell that no one, whether he be Hindu or Mahomedan, rich or poor, would use it for eating purposes.

24. In 1913, I submitted to the Agricultural Chemist the following four samples of denaturalised salt for his opinion :—

(1) One sample of salt denaturalised with 5 per cent. bone dust and 1 per cent. fuel oil.

(2) One sample of salt denaturalised with 5 per cent. bone dust and 2 per cent. fuel oil.

(3) One sample of salt denaturalised with one per cent. fuel oil only.

(4) One sample of salt denaturalised with 2 per cent. fuel oil only.

25. The report of the Agricultural Chemist on the above samples is as follows :—

“ I.—Sample of salt denaturalised with 5 per cent. bone dust and 1 per cent. fuel oil.—This when dissolved in water and filtered gave yellow filtrate smelling badly of the putrified matter from the bone dust. On evaporation salt was recovered but the offensive smell persisted and the salt had yellow colour. On strongly heating the salt it charred and gave out a very disagreeable smell showing the presence of soluble organic matter in the bone dust. ”

“ II.—Sample of salt denaturalised with 5 per cent. bone dust and 2 per cent. fuel oil.—This gave exactly the same result as above excepting that the yellow colour and the disagreeable smell were more pronounced. ”

“ III.—Sample of salt denaturalised with 1 per cent. fuel oil.—This on dissolving and filtering gave clear filtrate without almost any smell ; on evaporating the liquid, good white edible salt was obtained. ”

“ IV.—Sample of salt denaturalised with 2 per cent. fuel oil:—This gave almost exactly the same result as sample No. III. ”

“ It seems from this that the efficient material for denaturalising salt is bone dust. Addition of fuel oil is of no use. ”

“ I therefore would prefer the method of adding 5 per cent. bone dust and 1 per cent. fuel oil so as to render common salt effectually inedible. ”

26. Last June, the Collector of Salt Revenue submitted a sample of salt denaturalised with bone dust and fuel oil to the Chemical Analyser to Government, who reported that edible salt could be separated from the sample by solution in water and filtration. Dr. Mann, however, held that while he agreed with the Chemical Analyser that one could, by solution and filtration in the laboratory, obtain edible salt from the denaturalised material, that was not possible among the cultivators among whom salt was used for agricultural purposes. If the bone meal used was of the lowest grade, containing very largely the refuse of the bone mills, the separation into edible material was practically impossible without special filtering appliances or without very long settling. The difficulty of separation was very considerable, practically impossible without either long waiting or special appliances.

27. In denaturalising salt with bone dust and black liquid fuel oil, samples of which referred to in paragraph 24 above were favourably reported on by the Agricultural Chemist, it was bone dust and not bone meal which was used. Ordinary bone meal costs Rs. 3 per Bengal maund and does not stink so much as bone dust. The price of bone dust which consists of the refuse of the bone mills is Rs. 1/10 per Bengal maund. It is obviously necessary to use the cheapest material for denaturalising salt, in order that the cost of denaturalising materials which are to be paid for by the cultivators may be kept at a minimum. In using bone dust, we certainly use a very efficient denaturalising material, inasmuch as it is cheaper and stinks more than bone-meal.

28. Hitherto, the question of the cost of separating edible salt from the denaturalised material has not been discussed. Last August, I carried out two tests to ascertain the cost of recovering salt from the denaturalised material. In each test, ten lbs. of salt were denaturalised with 5 per cent. bone dust and one per cent. fuel oil. The denaturalised material was dissolved in 25 lbs. of water and the solution filtered and evaporated in an ordinary

earthen pot. About 10 lbs. of salt were recovered at the end of each test. The cost of recovering the salt was as follows :—

Item of cost.	First test.	Second test
	Rs. a. p.	Rs. a. p.
Price of 10 lbs. of denaturalised salt at the concession rate of 10 annas per maund ... ..	0 1 3	0 1 3
Labour—one man ; for 4 hours for dissolving the salt, etc. ...	0 2 0	0 2 0
Cost of fuel for evaporating the solution ... ..	0 5 6	0 4 6
Total cost ... ..	0 8 9	0 7 9

29. In the first test 55 pounds of fuel was burnt for evaporating the solution and in the second test 45 pounds of it. Fuel is dear in the Ratnágiri District and the expenditure entered as cost of fuel is what was actually paid for purchasing it. The ordinary duty-paid salt is sold in the bázár at Rs. 1/12 per Bengal maund, whereas the price of fuel alone for separating one maund of salt from the denaturalised material would be about Rs. 2-8-0. It is therefore extremely unlikely that the cultivators receiving the denaturalised salt for manuring purposes would try to recover edible salt from the denaturalised material. It may be further pointed that the salt denaturalised with five per cent. bone dust and one per cent. fuel oil smells so badly that it is almost certain that none would use it as such for eating purposes, whether he be Hindu or Mahomedan, rich or poor.

30. In May 1913, 50, 200, 50 and 100 maunds of salt were denaturalised with 5 per cent. bone dust and one per cent. black liquid fuel oil, and issued from the fish-curing yards at Ratnágiri, Vengurla and Belekeri (Kánara) and the salt works at Mátunga, respectively. This total quantity of 400 maunds sanctioned by the Collector of Salt Revenue has been partly utilised for experiments carried out by the officers of this Department and partly distributed to suitable cultivators for trial on their own lands. In addition to 7 annas per maund which was paid to the Salt Department, an extra charge of 2 annas per maund of salt issued, as cost of materials required for denaturalising it was recovered from the cultivators who received the salt. There were many applicants in the Thána, Ratnágiri and Kánara Districts who applied for salt at this rate of 9 annas per maund. But most of them could not be supplied with salt, as the total quantity of salt required by them greatly exceeded the quantity sanctioned by the Collector of Salt Revenue.

31. The Salt Department at present charges 7 annas per maund of salt issued to fishermen for fish-curing purposes and this is the uniform rate charged at all the fish-curing yards in the Ratnágiri and Kánara Districts, though the supplies of salt required for all the different fish-curing yards are obtained from the salt works at Uran. The salt required for manuring purposes need not be so good as what is required for fish-curing. It is reasonable that the cultivators requiring salt for manuring purposes should pay at this rate of 7 annas per maund and also bear the cost of denaturalising materials.

32. For denaturalising the 400 maunds of salt above referred to, I obtained 20 maunds of bone dust at Rs. 1/10/- per maund from Karáchi. The price quoted by the Thána Bone Mill was Rs. 3 per maund. I also obtained 900 lbs. of black liquid fuel oil from Messrs. Shaw Wallace and Company of Bombay at the rate of Rs. 60 per ton. The freight charges that had to be paid on these small consignments despatched to Mátunga, Ratnágiri, Vengurla and Kárwár amounted to considerable sums. For 20 maunds of bone dust and 329 lbs. of fuel oil required for denaturalising the 400 maunds of salt the following amount was the cost actually incurred :—

Item.	Rs.	a.	p.
Price of 20 maunds of bone dust at Karáchi	...	32	8 0
Freight on do.	...	29	0 0
Price of 329 lbs. of fuel including freight	...	12	8 0
Total	...	74	0 0

33. The total cost of Rs. 74 on materials required for denaturalising 400 maunds of salt works out at the rate of about 3 annas per maund. I therefore propose that the Salt Department should stock bone dust and fuel oil at the salt works and fish-curing yards and issue salt for *bonâ fide* agricultural purposes at the rate of 10 annas per maund. The agriculturist, who applies for salt, should provide the necessary coolie labour for mixing salt with the denaturalising materials which should be supplied by the Salt Department without any extra charge. It need not be repeated that the charge of 10 annas per maund of salt would include 3 annas as cost of the materials required for denaturalising a maund of salt.

## CHAPTER IV.

## EXPERIMENTS.

34. In June 1911, the Fieldman stationed at Ratnágiri carried out an experiment at Shivrā near Ratnágiri, by applying salt to grafted mango trees. Twenty "apooos" trees in two groups, each of ten, were selected. The ten trees of one group were approximately similar to the ten of the other group, in point of age, growth and vitality. The trees of one group were each given a dressing of 10 lbs. of duty-paid salt in June and the other ten trees kept untreated. The fruits of each of the twenty trees were counted in the mango season of 1912. The following statement shows the number of fruits yielded by the twenty mango trees under experiment :—

Serial No. of trees.	No. of fruits yielded by trees treated with salt.	No. of fruits yielded by trees which were not treated with salt.
1	45	15
2	50	20
3	60	25
4	55	22
5	48	26
6	63	19
7	56	27
8	40	16
9	36	14
10	45	17
	498	201

35. The cost of salt applied to all the ten trees was not more than Rs. 1-12-0 even at the bázár rate of price, whereas an increase in the yield no less than 297 fruits, valued at Rs. 30 was effected by the application of salt.

36. Experiments were conducted in 1912 with the salt denaturalised with 5 per cent. cow-dung which was issued by the Salt Department from the fish-curing yards at Vengurla and Ratnágiri and the salt works at Mátunga.

37. At Vengurla 75 maunds of denaturalised salt were supplied to seven cultivators. For cocoanut and mango a dressing of 10 lbs. of salt was given per tree. For rice, salt was applied to the land at the rate of 10 Bengal maunds per acre and ploughed in. The fields were either sown with sprouted rice seed ("rahu") or transplanted with rice seedlings. The cultivators who used the salt all report that the mango and cocoanut trees were benefited

by the application of salt and that the outturn of paddy also was increased by it.

38. At Ratnágiri, the application of salt to cocoanut and mango trees was found to be beneficial. In the case of rice also, salt applied to the fields benefited the crop. In one of the gardens in which denaturalised salt was applied to cocoanut trees at the rate of 10 lbs. per tree, the application did not produce an increase in the yield of nuts. But in the same garden two of the four young cocoanut trees under experiment came into bearing, as the result of the application of salt, though the other two which were not treated with salt have not yet borne flowers.

39. In the Thána District, where the salt issued from the Mátunga salt works was utilised for experiments, satisfactory results were obtained.

40. Denaturalised salt was applied to cocoanut trees at the rate of 10 lbs. per tree at Juvem in Salsette, at Bassein and at Uran.

41. At Juvem, 40 cocoanut trees were selected in Mr. N. B. Thakur's garden and of them 20 were treated and the other 20 kept untreated.

The following statement shows the yields of the treated and untreated trees :—

Serial No.	No of nuts yielded by treated trees.	No of nuts yielded by untreated trees.
1	13	58
2	2	18
3	36	33
4	63	37
5	6	5
6	25	20
7	52	13
8	36	7
9	34	4
10	.....	20
11	16	6
12	35	60
13	60	11
14	12	.....
15	14	6
16	7	8
17	.....	15
18	32	.....
19	10	35
20	8	6
	461	362

42. The treated 20 cocoanut trees yielded a total of 461 nuts, *i.e.*, an average of 23 nuts per tree, whereas the 20 untreated trees yielded 362 nuts, giving an average of 18.1 nuts per tree. The price of 5 nuts which is the difference is about 5 annas, which was obtained at a cost of  $1\frac{1}{4}$  annas as the price of 10 lbs. of denaturalised salt at the concession rate of 10 annas per Bengal maund.

43. At Bassein, in the garden of Mr. Hargovan Vanmali, 20 treated trees yielded 328 nuts, whereas 20 untreated trees yielded 237 nuts. The average difference in the yield due to the application of salt was 4.5 nuts per tree.

44. At Uran, in the garden of Khán Bahádur Hormusjee Manekjee Bhiwandiwalla, 30 cocoanut trees were taken and 15 treated with salt. The treated 15 trees yielded 1,093 nuts, whereas the untreated 15 trees yielded only 973. The average difference in yield due to the application of salt was 8 nuts per tree.

45. Denaturalised salt was applied to grafted mango trees at Thána and Uran and good results were obtained.

46. An experiment was carried out at Umbargaon by applying salt to the rice lands at the rate of 800 lbs. per acre and ploughing it in. Rice-seedlings were transplanted at the usual time. The results obtained are tabulated below :—

Variety of rice.	Area of the plot (gs.)	Quantity of salt in lbs. applied per acre.	Yield in lbs. per plot.		Yield in lbs. per acre.		Remarks.
			Grain.	Straw.	Grain.	Straw.	
Tambus ...	10	800	315	413	1,260	1,652	
" ...	10	Nil.	275	325	1,100	1,300	
" ...	8	800	250	308	1,250	1,540	
" ...	8	Nil.	198	242	990	1,210	

47. The average increase in the outturn due to the application of salt was 210 lbs. of grain and 341 lbs. of straw per acre.

## CHAPTER V.

### OPINIONS.

48. Dr. Mann, Agricultural Chemist to the Government of Bombay, has placed the following on record :—

"I am almost sure that the salt is used in connection with mango trees as a means of preventing soil completely



drying up. Cocoanuts stand separately in that they are salt-loving plants and need it to completely ripen their fruits. I have known cocoanuts in North East India far from the sea which never bore any fruit until salt was applied, when they gave a crop. But as regards the use of salt for mangoes, I am almost certain that it is to keep the soil more moist that it is used. I think the use of salt to kill insects is purely a secondary one—the primary use being that of keeping the soil more moist and consequently affecting its physical texture and making it more retentive.

“ I do not understand why the salt is required for rice.”

49. I have consulted Professor T. B. Wood of the Cambridge University Department of Agriculture and he has kindly written to me to say that common salt has been proved to be beneficial to Mangel-wurzel. Some farmers in England believe that salt is beneficial to barley crop. But when field-trials were made, no conclusive results were obtained.

50. The following is a remark from the pen of Mr. Keatinge, C.I.E., I. C. S., Director of Agriculture :—

“ For *primâ facie* it seems strange that when land is salt we should remove the salts and when it is sweet we should want to apply them.”

51. In support of Mr. Keatinge's view, I would state that in February 1911, the managers of the Shiddheswar “ gazni ” or “ khar ” near Gokarn in Kánara let in salt water through sluice-gates and inundated the whole area with creek-water for three weeks. The reason alleged for the step taken was that the “ gazni ” was getting too sweet for salt or “ kagga ” paddy, as the embankment shutting out the creek water had remained unbroken for the last 20 years. In ordinary circumstances, the chief concern of a “ khar ” or “ gazni ” owner is to prevent salt water getting into the land by keeping the embankment in good repair. The salt paddy is tolerant of a certain proportion of salt in the soil. Whenever the salt content of the soil falls below that proportion, salt water has to be let in, in order to make the land suitable for the salt paddy. At Durbár in Goa, I have seen some cultivators taking salt-water from the nearest creek and applying it in the fair season to high-lying or “ barad ” lands, which grow an early variety of sweet rice in the monsoon.

52. In an experiment carried out by the Agricultural Department in Travancore, the application of salt to 30 diseased cocoanut trees is reported to have improved those trees. The “ special cocoanut manure ”, which the Travancore Agricultural Department supplies to cultivators, contains 2 per cent. common salt.

## CHAPTER VI.

## CONCLUSIONS AND RECOMMENDATIONS.

53. In the foregoing pages it has been shown that salt-mud, salt-earth or sand would not meet the demand for salt for manuring purposes; that no one is likely to utilise for eating purposes the salt denaturalised with 5 per cent. bone dust and one per cent. black liquid fuel oil; and that the cost of fuel alone would effectually prevent anyone attempting to recover edible salt from the denaturalised material.

54. The opinion of scientists is not altogether unfavourable. They admit that for some crops at least common salt has its use as manure. For many years past, the people in the Konkan have been applying for duty-free salt for manuring purposes. It is, therefore, reasonable for Government to go ahead on the opinion of intelligent cultivators and order the issue of denaturalised salt from fish-curing yards and salt works at the rate of 10 annas per maund to selected agriculturists in the Thána, Kolába, Ratnágiri and Kánara Districts. For selecting the applicants to whom salt should be issued the help of the Department of Agriculture may be taken.

55. I suggest the following procedure for consideration. Any agriculturist resident in the Thána, Kolába, Ratnágiri and Kánara Districts may apply for salt for manuring purposes, through the Mámlatdár of his táluka, to the Extra Deputy Director of Agriculture by the end of July. The Extra Deputy Director of Agriculture should furnish the Assistant Collectors of Salt Revenue by the end of August with lists showing the names of selected agriculturists, the quantity of salt to be issued to them and the fish-curing yards and salt works from which it is to be issued. The agriculturists should be required to deposit, by the end of September, a sum of money at the rate of 10 annas per maund of salt granted to them, with the Sarkárkúns in charge of the fish-curing yards and salt-works. The Salt Department should by the 15th of November arrange to stock the required quantity of salt, bone dust and black liquid fuel oil at the fish-curing yards and salt works and issue and continue to issue denaturalised salt for six months ending 15th May. The agriculturists to whom salt is to be issued should provide the necessary coolie labour for mixing salt with the denaturalising materials to be supplied by the Salt Department. If anyone to whom salt has been sanctioned does not take delivery of it within the prescribed time the amount deposited by him with the Sarkárkún should be forfeited to the Salt Department; but if the Salt Department has not been able to supply salt to any one, his deposit with the Sarkárkún should be refunded to him.

56. The grant of the concession urged in the foregoing pages on the attention of Government would, as pointed out by a former Collector of Ratnágiri, be certainly appreciated by the agricultural population and regarded as a great boon throughout the districts of Thána, Kolába, Ratnágiri and Kánara.

V. H. GONEHALLI,  
Extra Deputy Director of Agriculture,  
Konkan Division.

## APPENDIX I.

No. 866 OF 1911-12.

Office of the Agricultural Chemist  
to the Government of Bombay:  
Poona, the 15th of December 1911.

Report on the composition of a sample of manure (salt) sent by the  
Divisional Inspector of Agriculture, Konkan, with his letter No. C-10,  
dated April 11th, 1911.

				Salt per cent
Sodium Chloride	...	...	...	92.56
Insoluble matter	...	...	...	3.10
Moisture	...	...	...	2.10

(Signed) H. H. MANN,  
Agricultural Chemist to the  
Government of Bombay.

(True copy.)  
V. H. GONEHALLI,  
Extra Deputy Director of Agriculture,  
Konkan Division.

## APPENDIX II.

O. 901 OF 1911-12.

*Office of the Agricultural Chemist  
to the Government of Bombay:*

*Poona, 22nd December 1911.*

Report on the composition of two samples of salt soils sent by the Divisional Inspector of Agriculture, Konkan, with his letter No. C/10, dated April 11th, 1911:—

	Salt-earth.	Salt-mud.
	Per cent.	Per cent.
Calcium Carbonate ...	0·01	0·01
Calcium Sulphate ...	1·03	0·16
Magnesium Sulphate ...	0·70	0·49
Magnesium Chloride ...	0·23	Nil.
Sodium Sulphate ...	Nil.	0·05
Sodium Carbonate ...	Nil.	0·01
Sodium Chloride ...	6·55	3·47
Total Salts ...	9·50	5·45
Nitrogen ...	0·06	0·04
Potash ...	0·54	0·41
Phosphoric Acid ...	0·11	0·22

(Signed) H. H. MANN,

Agricultural Chemist to the  
Government of Bombay.

(True copy.)

V. H. GONEHALLI,

Extra Deputy Director of Agriculture,

Konkan Division.

## APPENDIX III.

*Agricultural Experiments.*

Supply of denaturalised salt to the cultivators in the Konkan for manurial purposes.

No. 1190.

REVENUE DEPARTMENT.

Bombay Castle, 5th February 1914.

Letter from the Director of Agriculture, No. A.-2578, dated 9th April 1912.

Letter from the Director of Agriculture, No. A.-6813, dated 20th September 1912.

Letter from the Director of Agriculture, No. A.-1376, dated 15th February 1913.

Letter from the Director of Agriculture, No. A.-10456, dated 27th November 1913.

Government Memorandum to the Commissioner of Customs, Salt, Opium and A'bkári, No. 11166, dated 10th December 1913.

Memorandum from the Commissioner of Customs, Salt, Opium and A'bkári, No. S. Mis.-2, dated 15th January 1914.

RESOLUTION.—The proposal made by the Director of Agriculture as regards the printing of Mr. Gonehalli's report as a bulletin of the Agricultural Department is sanctioned.

2. The Collector of Salt Revenue, Bombay, should be requested to arrange for the issue of as much salt as may be wanted by the Agricultural Department to meet the requirements of cultivators during the next three years at the price suggested by the Commissioner of Customs, Salt, Opium and A'bkári.

3. The procedure suggested by Mr. Gonehalli in paragraph 55 of his report should be followed.

(Signed) C. W. A. TURNER,  
Under Secretary to Government.

(True copy.)

V. H. GONEHALLI,  
Extra Deputy Director of Agriculture,  
Konkan Division, Ratnágiri.

## LIST OF AGRICULTURAL BULLETINS PUBLISHED BY THE DEPARTMENT OF AGRICULTURE FROM 1908 TO 1913.

No.	Year.	Subject.
80	1908	Field, Garden and Orchard Crops of the Bombay Presidency, by G. Gammie, Economic Botanist, Bombay
81	1908	Establishment and Management of the Dairy Farm, by G. K. Kelkar, Assistant Professor of Agriculture
82	1908	Locusts in India, by H. M. Lefroy, Imperial Entomologist, Pusa
83	1909	Cultivation of Broach Cotton in Dhárwar, by M. L. Kulkarni, Divisional Inspector of Agriculture, S. D.
84	1909	Night-soil—A Valuable Manure, by G. K. Kelkar, Assistant Professor of Agriculture, Agricultural College, Poona
85	1909	Kalar in Sind, by G. S. Henderson, Deputy Director of Agriculture, Sind
86	1910	First Experiments in the Treatment of Grape-vine Mildew in the Bombay Presidency, by W. Burns, Economic Botanist
87	1910	An Examination of the Seed-supply of the Broach District, by G. D. Mehta
88	1910	Experiments with the Water-finder, by H. K. Mehta, Assistant Professor of Physics, etc., Poona Agricultural College
89	1910	The Salt Land of the Nira Valley, by Harold H. Mann, Principal, Agricultural College, Poona, and V. A. Tamhane, Laboratory Assistant, Agricultural College, Poona
40	1911	Cultivation of Guavas near Poona, Dhárwar and Limbgaon, by L. E. Kulkarni, L.Ag., Agricultural Department, Bombay
41	1911	Groundnuts in the Bombay Deccan, by G. K. Kelkar, Assistant Professor of Agriculture, Poona
42	1911	Note on Long-stapled Cotton in Sind, by G. S. Henderson, N.D.A., N.D.D., Deputy Director of Agriculture, Sind
43	1911	An Examination of the Seed-supply of the Broach District, Part II, by G. D. Mehta, L.Ag. (Bombay), B.A. (Cantab.), N.D.A., N.D.D.
44	1911	Preliminary Study of the Red Rot of Sugarcane in the Bombay Presidency, by G. S. Kulkarni, L.Ag., Assistant Mycologist
45	1911	Second Year's Experiments in the Treatment of Grape-vine Mildew in the Bombay Presidency, by William Burns, B.Sc. (Edin.), Economic Botanist to the Government of Bombay
46	1911	Seed Selection Series, I, Broach Cotton, by T. Forster Main, B.Sc., Deputy Director of Agriculture, Bombay Presidency, Poona
47	1911	San Hemp ( <i>Orotolaria Juncea</i> ), Tág (Maráthi), by P. C. Patil, L.Ag., Divisional Inspector of Agriculture, C. D.
48	1911	Poona Furnace (in the Sátara District), by P. C. Patil, L.Ag., Divisional Inspector of Agriculture, C. D.
49	1911	An Examination of the Seed-supply of the Ahmednagar District, Part I, by G. D. Mehta, L.Ag. (Bombay), B.A. (Camb.)
50	1912	An Examination of the Seed-supply of the Ahmednagar District, Part II, by G. D. Mehta, L.Ag. (Bombay), B.A. (Camb.)
51	1912	Third Year's Experiments in the Treatment of Grape-vine Mildew in the Bombay Presidency, by W. Burns, B.Sc. (Edin.), Economic Botanist to the Government of Bombay, and G. B. Patwardhan, B.Sc. (Bombay), Assistant Economic Botanist
52	1912	Muscovado Sugar Machinery and its scope for <i>Gul</i> manufacture in India, by G. N. Sahasrabudhe, L.Ag.
53	1912	A Method of Improving the Quality of Cotton Seed, by G. D. Mehta, B.A. L.Ag., N.D.A., N.D.D., and V. G. Gokhale, L.Ag.
54	1912	A Note on Steam Ploughing, by A. A. Musto, P. W. D., Agricultural Engineer, Bombay Presidency
55	1913	An Examination of the Seed-supply of the Poona District, Parts I and II, from the Seed Testing Department, Agricultural College, Poona
56	1913	Present State of the Dairying Industry in Bombay, by J. B. Knight, M.Sc., Professor of Agriculture, and E. W. Horn, Manager, Government Civil Dairy
57	1913	Improvement of the Indigenous Plough of Western India, by S. S. Godbole, L.O.E., Assistant Professor of Physics, Agricultural College, Poona
58	1913	Prickly-Pear Experiments by E. W. Horn, Manager, Government Civil Dairy
59	1914	Common salt and its use as Manure in the Konkan Division, by Venkann Hosabnaik Ganehalli, M.A. (Cantab.), etc., Extra Deputy Director of Agriculture, Konkan Division