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TAMIL NADU ARCHIVES

GOVERNMENT OF TAMIL NADU

REVENUE DEPARTMENT

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Archives I—5,806—24-2-78.

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GOVERNMENT OF MADRAS.

REVENUE DEPARTMENT.

23rd July 1878, No. 1,148.

Read the following paper :—

No. 292. Proceedings of the Board of Revenue, dated 16th May 1878, No. 1,324.

Read the following letter from W. R. ROBERTSON, Esq., M.R.A.C., Superintendent of Government Farms, to H. E. STOKES, Esq., Secretary to the Board of Revenue, dated Sydapet, 22nd December 1877, No. 1,085 :—

I HAVE the honor to submit my annual report for the official year ending 31st of March 1877. A report on the results of the experimental culture of Carolina paddy in this Presidency forms a part of the annual report; this portion has however, in accordance with the directions of the Board, been already separately submitted.

2. As directed in the Proceedings of the Board, Miscellaneous No. 8,076, dated the 5th of June 1877, I forwarded to the Director of Public Instruction a copy of the portion of the report that refers to the Agricultural College.

ENCLOSURE No. 1.—Report on Government Farms.

THE report of the Superintendent of the Government Farms for the year 1876-77 will be forwarded for the consideration of Government.

2. The most important fact mentioned in the report is that the Agricultural College was opened in October 1876, and it is gratifying to learn that numerous applications for admission were received by the Superintendent from all parts of India and in many instances from well educated youths whose training in scientific agriculture may be expected to have considerable effect on the progress of agricultural improvement throughout the country.

3. A reference to the statement shows that twenty-seven agricultural students were under education in the winter session ending March 1877; and judging from the marks awarded, it would appear that many did well and some very well at the weekly examinations throughout the course.

4. It is also very satisfactory to know that persons engaged in agriculture are increasingly communicating with the farm authorities with a view to obtain practical information on matters appertaining to their particular pursuits. Mr. Robertson is encouraging such inquiries, and will doubtless give attention to the best means of making public the information collected and conveyed on these occasions in such manner that it may be as practically and extensively useful as possible.

5. On the farm itself the drought interfered with ordinary operations, but the advantages of deep ploughing were all the more clearly shown.

6. There is much useful information to be found in the report, and many suggestions which the Board hope may gradually find their way to the agriculturists of the country and be adopted by them. But it must be observed that there is a great deal both of information and advice—excellent in itself and of much practical import if appreciated—that would find fitting place in a manual of agriculture, but that is somewhat out of place in an annual report of the working of a department. The Board by no means think the very elements of agricultural science are so well known that their exposition and repetition are unnecessary; but this should be reserved for separate papers, or appendices that may be published in District Gazettes, &c., independently, and the annual report, in its body at least, should be confined to showing the operations and progress of the department for the year

under notice. For example, paragraphs 10 to 29 discuss general questions of rotation and courses of crops. They state no results obtained on the farm. They are generally instructive, but are not descriptive of experiences as paragraphs 30, 31, &c., paragraphs 39, 40, &c., distinctly are. Such remarks should be omitted or very sparingly introduced in annual reports in future. How information of the sort can be best brought home to the classes who will benefit themselves and the State by applying it in practice is a question which must engage the Board's attention, but it is one which they will be in a better position to consider satisfactorily after the receipt of the orders of Government on the Proceedings relating to the question of agricultural education generally in this Presidency (*vide* Board's Proceedings, dated 13th December 1877, No. 5,223).

7. The Board consider carefully prepared statements of the particulars of the cultivation of certain areas with specified crops in the year to be very valuable, and that analyses of the results of such experiments are most fitting in the report of the year's work. Of course, the utmost attention should be paid to economical working in these experiments, not only on general considerations, but that the advantages of the system pursued and recommended may be as apparent as possible. It should not be lost sight of however in considering results that in the circumstances of a Government Farm the net returns in particular cases cannot be made the test of the advantages or disadvantages of a system advocated on scientific principles. Private agriculturists will undoubtedly be able to work on the same principles at a very much lower rate of expenditure than is obtainable, even with the most careful management on a Government Farm, and the difference they may reasonably look to saving must be credited to the profit side before the net returns that may be expected in private enterprise can be fairly calculated.

8. The report of the year just ended will shortly be looked for, and it is hoped will give a favorable account of the progress of the institution of which the report under notice records the satisfactory commencement.

9. Some papers are printed with the annual report—on "the Carolina Paddy experiments in the Madras Presidency," "the growth of forage for live stock," "the pernicious effects of the use of cattle dung as fuel," &c. By placing the report on the Editor's table an opportunity will be given for the dissemination of the information they contain.

10. The classified financial information, the absence of which from the last report was noticed by the Secretary of State, is not to be found in this report either, but the Superintendent has been asked to report on the matter with reference to paragraph 2 of G.O., dated 2nd April 1878, No. 519.

(A true Copy and Extract.)

(Signed) J. STURROCK,
Acting Sub-Secretary.

No. 293. ORDER THEREON, 23rd July 1878, No. 1,148.

Miscellaneous.

THE Board forward the report of the Superintendent of Government Farms for 1876-77. This embraces an account of some of the years operations on the Sydapet Farm, a report on the progress of the School of Agriculture opened in October 1876, and some papers on agricultural topics drawn up by the Superintendent himself or the farm officers.

2. A history of the various experiments made during the last 7 or 8 years in the cultivation of Carolina paddy is also appended with notes on the habits and customs of this plant in America. These last have already been submitted to Government in a separate form and the School of Agriculture having its place in the general report of the Director of Public Instruction will not be noticed here.

3. In the report on the season at Sydapet there is some instructive information as to the rainfall, which in any one month of the last seven years has but rarely approximated the average deduced from sixty years' observations at the Observatory, which is only about 3 miles distant.

4. In 1876 the rainfall seems to have been fairly sufficient until the second week of September, but its subsequent failure during the north-east monsoon was very marked and appears to have been altogether insufficient to admit of wet crops being raised. This being the chief cultivating season in the district in which the farm is situated the methods of cultivation adopted on the latter were subjected to a crucial test. In the case of the crops reported on, the result was highly gratifying, for deep cultivation and high manuring secured a fair outturn, and one that, with straw and grain at famine prices, was distinctly remunerative. How much this result was due to deep cultivation is demonstrated by the contrast worked out between the yield on the body of the fields and that on the head lands where the cultivation was shallower, though not more so than in the ordinary practice of the country.

Paragraph 39.

Paragraph 31.

5. The dry crops planted in October had a rainfall of about 5 inches on 12 or 14 days, while a crop sown in November had only 1·71 inches on 6 days, and another, put down in December, only ·16 inches on 3 days.

It is noteworthy that the yield of straw in the last two cases was on a par with that of the crops that received more rain, but that the grain outturn was small.

Deep cultivation is also reported to have secured very satisfactory growth in the case of the cotton and indigo crops, but the final results will not appear until next year's report.

6. In the matter of special crops it is noted that of five carob trees which had been planted eleven years, one has at last fruited, and that it is believed that it is the only female plant. Grafting the seedlings of this tree from known male or female plants is accordingly recommended.

7. No mention is made of the buffalo grass which was favorably reported on last year. The results of further experience in its cultivation should be noticed in next report. The Government also hope that the proposed* experiment to induce New Orleans cotton to alter its bearing season will not be lost sight of.

*Paragraph 151, Report for 1875-76.

8. In paragraphs 77 to 85 are recorded the results of some topdressing experiments made with saltpetre and bone charcoal on land sown with yellow cholum, but the dry season is said to have been unfavorable to the use of the former. The gain directly traceable to its use was not sufficient to repay the outlay, but it is hoped that the soil was permanently improved to the benefit of future crops. Bone charcoal is believed to be useless as a topdressing when used by itself, but further experience seems needed to place the matter beyond doubt.

9. In last year's report it was stated that indifferent results had been obtained in growing ground-nuts, and it was suggested that this was due to a want of lime in the soils of the farm. This conjecture is now shown to have been correct, for a crop of ground-nuts manured with lime gave an abundant yield. The general use of this manure is however not recommended as its stimulatiug qualities render it of dangerous utility in the hands of the ignorant or shortsighted cultivator.

10. The stock breeding experiment has been delayed from several causes, but the flock of sheep kept on the farm has thriven well. The loss was exceptionally small, and this is attributed to the absence of the rank grasses that spring up with an abundant rainfall. The quality of wool improved, but the yield per head was less, though found to be fair for the weight of the sheep.

11. The Government note that the Board have called for a report in regard to the financial statement desired by the Secretary of State. In this the farm accounts should be kept distinct from those of the School of Agriculture.

12. The Board further remark that portions of the farm report are devoted to conveying advice on various topics which are not directly illustrated by reference to any particular operations on the farm. These remarks they consider would find a more appropriate place in a manual of agriculture, and in this view the Government concur. The preparation of such a manual is a work that may well engage the early attention of Mr. Robertson and his Assistants, and much of the requisite matter is to be found in the interesting papers which accompany the present report.

13. The report on the farm should deal only with its working but should show clearly and in sufficient detail what was done and left undone—the total extent, the area under wet and dry cultivation, the extent of grazing lands, &c. &c., and the financial results. From the present report the Government are unable to gather how far lands were left uncultivated or crops lost, or how the stock was maintained, and desire that the Superintendent will, if possible, supply this information at once. The record of the experiments made in cultivation and with special crops is useful and interesting, and should of course be continued, but the plan on which the whole operations are being conducted, and how far it was successful or the reverse, should also be shown, as well as the extent to which the deeper cultivation had been rendered possible or aided by artificial raising of the soil.

The Government cannot expect that the farm should be directly profitable, being used for experiments which may or may not succeed, but they wish to make it really beneficial, and believe that this end may best be secured by subjecting its entire practice to public criticism.

14. In connection with this point the Governor in Council learns with satisfaction that the Superintendent's correspondence on agricultural matters is increasing and that information is offered as well as sought. This fact and the numerous applications for admission to the School of Agriculture evidence a growing desire for an improved agriculture which must be a source of well founded satisfaction to the Superintendent and his Assistants and is in a great measure the fruit of their zealous and intelligent efforts.

15. The Government consider that the papers contributed to this report by Messrs. Benson and Shiffmayer reflect much credit on those officers, and Mr. Robertson himself has done well in calling attention to some neglected manural substances, though the inference as to the high death-rate of farm stock drawn by him from the Customs House returns of exported hides and skins is based on incorrect premises. Large consignments of both skins and hides being regularly sent down by rail from both Bengal and Bombay to this Presidency to be cured and exported, as the product of Madras tanneries.

16. The Superintendent will submit his report for 1877-78 with the least possible delay and his annual report will in future be despatched to the Board of Revenue not later than the 30th June.

(True Extract.)

(Signed) C. G. MASTER,
Secretary to Government.

To the Board of Revenue.

Exd. W. J. Lewis.

1148/3

Griffiths

Copy of (1878) 28 Annual Report of the Superintendent of Government Farms (Madras Presidency) for the year ending 31st March 1877. Madras: Printed by E. Keys, at the Government Press, Fort St. George. 1877.

REVENUE.

To

The Board of Revenue

Sir,

I have the honor to submit

Vide cut. no 6 of 1878.

V. Ch. No 535 of 79.

THE ANNUAL REPORT OF THE SUPERINTENDENT OF GOVERNMENT FARMS (MADRAS PRESIDENCY)

FOR THE YEAR ENDING 31st MARCH 1877.

MADRAS:
PRINTED BY E. KEYS, AT THE GOVERNMENT PRESS, FORT ST. GEORGE.
1877.

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THE

ANNUAL REPORT

OF THE

SUPERINTENDENT OF GOVERNMENT FARMS

(MADRAS PRESIDENCY),

FOR THE YEAR ENDING 31ST MARCH 1877.

MADRAS:
PRINTED BY E. KEYS, AT THE GOVERNMENT PRESS, FORT ST. GEORGE.
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Read the following letter from W. R. ROBERTSON, Esq., M.R.A.C., Superintendent of Government Farms, to H. E. STOKES, Esq., Secretary to the Board of Revenue, dated Sydapet, 22nd December 1877, No. 1,085 :—

I HAVE the honor to submit my annual report for the official year ending 31st of March 1877. A report on the results of the experimental culture of Carolina paddy in this Presidency forms a part of the annual report; this portion has however, in accordance with the directions of the Board, been already separately submitted.

2. As directed in the Proceedings of the Board, Miscellaneous No. 8,076, dated the 5th of June 1877, I forwarded to the Director of Public Instruction a copy of the portion of the report that refers to the Agricultural College.

THE

ANNUAL REPORT

OF THE

SUPERINTENDENT OF GOVERNMENT FARMS,

FOR THE

YEAR ENDING 31ST OF MARCH 1877.

INTRODUCTORY.

THE history of agriculture in this Presidency, during the past year is one continuous record of disaster, due chiefly to the unpropitious character of the weather. Hence, the operations of this Department were not so extensive as they would otherwise have been. Nevertheless, a good deal of useful work was done, and numerous facts gathered which cannot but prove useful in suggesting the direction, in which efforts should be made to avert from our agriculture, such calamitous results as those which were so severely experienced during the past year.

No District tours were undertaken by any of the Officers of the Department as, from the almost entire cessation of all agricultural work, it was thought that no good could result from such tours.

The Agricultural Exhibition, which was to have been held in February last, was again postponed.

The Agricultural College was opened in October last, and is now in full operation. It is gratifying to note that numerous applications for admission into it, were received from all parts of India and, in many instances from well-educated youths, likely to benefit from the instruction afforded in the institution, and, prove of use afterwards in the great work of agricultural improvement. The organization of the institution necessarily demanded much careful attention, and occupied a good deal of time. But, the results that have been secured and those that promise to follow, will fully compensate for the labor and time expended.

The drought, of course, proved very detrimental to the cultivation of the Sydapet Experimental Farm. The necessity of providing food for the large number of cattle and sheep on the Farm, prevented the carrying out of any extensive experiments on the land where irrigation water was available. However, the crops produced without irrigation water were, in several instances very satisfactory, especially those sown early; one crop of Sorghum Saccharatum, as will be noticed on perusing the Farm Report, yielded 5,000 lbs. of straw and 924 lbs. of grain, per acre; while, crops of Yellow Cholum and Planter's Friend yielded from 300 to 450 lbs. of grain and 2,500 to 4,000 lbs. of straw, per acre. The advantages that result from deep culture were very clearly shown in the past year. The most casual observer, in looking over the crops during the drought, could not have failed in noting the remarkable superiority of the plants growing on the deeply tilled soil, compared with those growing on the head-lands of the fields and other shallow cultivated land.

The appointment of Inspector of Cattle Diseases, was vacant during the year, Veterinary Surgeon Western who held it, having vacated the appointment for other duties. Veterinary Surgeon Adams was temporarily employed in connection with the outbreak of cattle disease in Wynaad and Coorg. Efforts are being made in Europe to procure a qualified Veterinarian for the vacant post. It is evident however from past experience that one Veterinary Inspector can effect but little good in dealing with a horned-stock amounting to about eight and a quarter million head, scattered over an area of about twenty-five million acres. It has been suggested that the Inspector should have stationed at the head-quarters of each District, an Assistant, of the grade of an Apothecary; such Assistants to be trained in the Agricultural College where, instruction is afforded in Veterinary Surgery.

It has been determined to make these annual reports something more than mere records of the condition and operations of the Department, in view to rendering them more generally useful. To this end, papers on agricultural subjects of interest, and, short reports on agricultural matters that have been submitted to the Board of Revenue, either by District Officers or, Officers of this Department, will be published with the annual reports. With the present report, there is not much of interest to be published regarding the agriculture of the Districts, due to the great difficulties that stood in the way of carrying out field experiments and, to the attention of those from whom otherwise reports might have been expected, having been absorbed in efforts for the preservation of the lives of those engaged in agriculture. A few papers are published which, it is believed, will prove useful to those engaged in agricultural pursuits.

The correspondence of the Department continues to increase and, as the increase is caused chiefly by more frequent communications with persons engaged in agriculture in various parts of the Presidency, is in[illegible] of advice founded on experience, is willi[illegible] and every effort is made to encourage[illegible] information is collected and diffused amo[illegible]s is very encouraging. Aid, in the shape [illegible]ly accepted from all who choose to afford it, [illegible]quiries, in this way valuable agricultural [illegible]st those interested.

WILLIAM R. ROBERTSON, M.R.A.C.,
Superintendent of Government Farms.

SYDAPET EXPERIMENTAL FARM.

SECTION I.

GENERAL.

1. *Rainfall.*—It is of far more importance for an agriculturist to know how the rain of a district falls, as a guide to the climate of it, than the total fall. If rain is precipitated in heavy falls at intervals of considerable duration, the cultivation of unirrigated lands must be a matter of difficulty, whilst for irrigated lands heavy falls are advantageous by filling the tanks, &c.

Importance of knowing character of fall.

2. Judging from the statement given below, the rainfall register in this country is not of much use to the agriculturist, as the seasons are so uncertain and varying; it only tells, what general observation has already discovered, the distribution of rainfall during the year:—

Register poor guide.

	Observatory Average 65 Years.	Sydapet Farm Average 7 Years.	1876-77.				1875-76.				1874-75.				1873-74.				1872-73.				1871-72.				1870-71.			
			Daily Falls.		Falls.		Daily Falls.		Falls.		Daily Falls.		Falls.		Daily Falls.		Falls.		Daily Falls.		Falls.		Daily Falls.		Falls.		Daily Falls.		Falls.	
	Wet Days.	Rainfall.	Total	Rainfall.	Under one Inch.	Over one Inch.	Total	Rainfall.	Under one Inch.	Over one Inch.	Total	Rainfall.	Under one Inch.	Over one Inch.	Total	Rainfall.	Under one Inch.	Over one Inch.	Total	Rainfall.	Under one Inch.	Over one Inch.	Total	Rainfall.	Under one Inch.	Over one Inch.	Total	Rainfall.	Under one Inch.	Over one Inch.
April	1	0·71	·67	·46	1	..	7·43	4·53	7	1	1·43	·81	1	..	·14	·14	2	..	2·38	·38	1	..	3·16	·16	2	..	7·02	2·02	5	2
May	2	2·07	1·43	2·17	3	..	6·71	3·69	10	2	9·44	..	..	..	6·79	6·66	4	2	6·66	5·66	6	1	7·24	3·24	6	1	8·50	3·50	8	2
June	7	1·99	5·00	3·22	5	1	10·58	3·84	10	2	16·52	2·82	6	1	10·59	1·66	6	1	12·50	1·50	11	1	16·62	4·62	8	2	5·41	1·41	11	3
July	12	3·81	7·71	4·16	11	..	10·99	3·67	3	3	9·99	..	..	..	3·54	1·50	6	1	7·24	1·24	5	1	12·50	2·50	6	1	1·30	..	1	..
August	13	4·53	7·43	6·00	7	..	10·99	3·69	2	1	4·21	..	..	..	9·99	3·16	2	1	8·91	2·91	3	1	10·90	2·90	4	1	1·30	..	1	..
September	10	4·83	6·71	4·57	3	..	10·99	2·10	1	..	4·21	..	..	..	10·59	3·16	2	1	12·50	2·50	5	1	16·62	4·62	8	2	5·41	1·41	11	3
October	12	10·99	10·58	6·44	3	2	10·99	3·84	2	1	6·30	..	..	..	7·21	1·21	3	1	8·91	1·91	4	1	10·90	1·90	5	1	1·30	..	1	..
November	13	13·17	11·43	7·14	4	2	11·99	3·74	5	1	16·52	2·52	6	1	9·91	1·91	3	1	10·90	1·90	5	1	16·62	4·62	8	2	5·41	1·41	11	3
December	7	6·10	4·15	2·86	2	..	11·99	1·14	1	..	2·99	..	..	..	1·10	..	..	..	1·90	..	..	..	1·30	..	..	..	1·30	..	1	..
January	2	·99	·57	·43	..	..	1·43	·14	1	..	·99	..	..	..	·77	·77	1	..	2·38	2·38	2	..	3·16	3·16	2	..	7·02	2·02	5	2
February	1	·30	·30	·13	..	..	1·43	·29	..	..	..	..	..	..	..	..	..	..	..	..	..	..	7·24	4·24	6	1	8·50	3·50	8	2
March	1	·45	·57	·57	..	..	1·43	·57	..	..	..	..	..	..	..	..	..	..	..	..	..	..	12·50	2·50	6	1	16·62	4·62	8	2
Total	80	48·94	67·01	40·72	39	7	105·39	32·72	43	11	73·44	6·31	14	2	57	15·38	34	7	68·58	14·58	46	8	105·39	32·72	43	11	57·07	20·88	50	16

From this statement it will be observed that, during the past seven years, the average rainfall of any one month has only in eight or nine cases approximated to the average registered during the past 60 years at the Madras Observatory, which is only 3 miles off. Comparing the average of the past 7 years here, with that of the past 60 years at the Observatory, the total for the year is 5 inches more; this excess occurring chiefly in September and June, whilst in December there is a deficiency.

Amount and season of fall irregular.

3. The usefulness of gentle showers at frequent intervals is acknowledged, and the statement endeavours in a measure to bring out the character of the rainfall by dividing the light and the heavy falls; it will be noticed that during the past 7 years 29 per cent. of the daily falls have been over 1 inch, varying from 45 per cent. in 1872-73 to 15 per cent. in 1876-77. In seven months only of the year is there usually a sufficient frequency of rain, that is from June to December inclusive; but, the monthly register is often delusive, as, owing to the high temperature that usually prevails, if a considerable lapse occurs between two falls of rain, all the bad effects of a prolonged drought will be seen, and although there may be an entry of a heavy rainfall and a large number of wet days in a month, that month may be most unpropitious for cultivation.

Proportion of heavy falls large.

4. *Season.*—The season has been a most unfortunate one for the agriculturist generally, more especially for the wet-land cultivator; for dry lands there was, as will be shown further on in this report, sufficient rain to mature fair crops of cereals, pulses, cotton, and indigo. The total deficiency of the rainfall from the average of the past 10 years was 29·38 inches, whilst the proportion of wet days to rainfall was higher, there being only 22 days fewer on which rain was registered, than the average.

Great deficiency.

5. Rain fell during April on only one day, which is about what is usually the case; in May 3 slight falls amounting in all to ·55 inches did not attain the average of 10 years by nearly an inch; during June, the same contrast with the average of previous in 6 days. July was marked by numerous, [illegible] latter part of the month according to the general custom, [illegible] numerous than usual, the register shows to have been lighter. In August very light showers, instead of the usual falls of medium amount were, until the last week, registered, these were insufficient for cultivation, but tended to promote the growth of weeds; in the last week however a considerable fall occurred, which would, had September continued as it began, have enabled dry crops to have been grown with ease, and what were sown would not have been ruined by the drought, which set in after the 5th of that month, and to which must be attributed much of the loss of crop on dry lands during the past season; the deficiency of rainfall during these two months was 4·76 inches, whilst there were 7 fewer wet days. The failure of the north-east monsoon rains in October and November was the cause of the failure of the wet crop, because the tanks, which these rains usually replenish, were not filled; the deficiency of rain amounted to nearly 16 inches and there was a corresponding decrease in wet days. In December the same failure continued; and during the three concluding months of the year there was scarcely any rain, only a very slight shower in the middle of January, and a sprinkling in March too slight to register.

6. The following table gives the monthly falls of the present compared with that of the past 10 years:—

—	1876-77.		Average of 10 Years.		—	1876-77.		Average of 10 Years.	
	Inches.	Wet Days.	Inches.	Wet Days.		Inches.	Wet Days.	Inches.	Wet Days.
April	·81	1	·26	·6	November ..	3·74	6	13·09	12·3
May	·55	3	1·48	1·9	December ..	·14	3	5·19	6·0
June	2·82	6	3·14	6·6	January ..	·02	1	1·08	1·4
July	3·67	11	4·15	8·8	February ..	..	..	·89	·8
August ..	3·69	8	5·92	9·8	March	..	..	·16	·5
September ..	2·10	4	5·53	9·0	Total ..	20·88	47	59·16	67·8
October ..	3·54	6	10·93	11·1					

7. In the next statement the rainfall of each week in the year is shown, this brings out more clearly the character of the season than the monthly statement does.

No. of the Week.	1876-77.		Average of the previous 10 Years.		No. of the Week.	1876-77.		Average of the previous 10 Years.	
	Inches.	Wet Days.	Inches.	Wet Days		Inches.	Wet Days.	Inches.	Wet Days.
1st Week ..	..	..	·22	·2	27th Week ..	1·34	1	1·30	1·8
2nd do. ..	..	..	·03	·2	28th do. ..	1·01	1	1·22	1·4
3rd do. ..	..	..	..	..	29th do. ..	·54	1	3·52	3·6
4th do. ..	..	..	·01	·2	30th do. ..	..	..	3·45	3·6
5th do. ..	·81	1	1·34	·5	31st do. ..	·45	2	1·39	1·9
6th do. ..	·48	2	·07	·1	32nd do. ..	·12	1	2·14	2·1
7th do. ..	..	..	·04	·2	33rd do. ..	2·07	3	3·07	3·1
8th do. ..	..	..	·002	·1	34th do. ..	..	..	2·87	3·3
9th do. ..	·82	2	·001	·1	35th do. ..	1·55	2	4·25	3·2
10th do. ..	..	..	1·10	1·2	36th do. ..	..	..	3·58	2·2
11th do. ..	1·65	2	1·12	1·9	37th do. ..	..	..	1·18	1·9
12th do. ..	..	..	·40	1·7	38th do. ..	..	..	·51	1·0
13th do. ..	·42	2	·41	1·5	39th do. ..	·14	3	·09	·7
14th do. ..	..	..	·35	1·3	40th do. ..	..	..	·02	·4
15th do. ..	·72	4	1·21	1·7	41st do. ..	..	..	·003	·1
16th do. ..	1·22	3	1·05	2·9	42nd do. ..	·02	1	·47	·7
17th do. ..	·93	3	1·04	2·2	43rd do. ..	..	..	·59	·4
18th do. ..	·80	1	1·20	2·1	44th do. ..	..	..	..	..
19th do. ..	·22	1	1·48	2·6	45th do. ..	..	..	·70	·6
20th do. ..	·40	2	·75	2·0	46th do. ..	..	..	·002	·1
21st do. ..	·36	2	1·33	2·1	47th do. ..	..	..	·12	·1
22nd do. ..	2·71	3	·94	2·1	48th do. ..	..	..	·14	·2
23rd do. ..	1·81	2	1·20	1·9	49th do. ..	..	..	·08	·4
24th do. ..	·01	1	1·30	2·1	50th do. ..	..	..	..	..
25th do. ..	..	..	1·73	2·1	51st do. ..	..	..	..	..
26th do. ..	·28	1	·93	1·7	52nd do. ..	..	..	..	..

8 In the statement below the daily registrations of the year are given :—

April 1876.	May 1876.	June 1876.	July 1876.	August 1876.	September 1876.
Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
1	1	1 .. ·75	1	1	1 .. ..
2	2	2	2	2	2 .. ..
3	3	3	3	3	3 .. ..
4	4	4	4	4	4 .. ·57
5	5	5	5	5	5 .. 1·24
6	6 .. ·41	6	6	6	6 .. ..
7	7 .. ·07	7	7	7	7 .. ..
8	8	8	8 .. ·07	8 .. ·22	8 .. ..
9	9	9	9	9	9 .. ..
10	10	10	10	10	10 .. ..
11	11	11	11	11	11 .. ·01
12	12	12	12 .. ·25	12 .. ·32	12 .. ..
13	13	13	13 .. ·25	13	13 .. ..
14	14	14	14 .. ·15	14	14 .. ..
15	15	15	15	15 .. ·08	15 .. ..
16	16	16 .. 1·	16 .. ·95	16	16 .. ..
17	17	17	17	17	17 .. ..
18	18	18	18	18 .. ·28	18 .. ..
19	19	19	19	19	19 .. ..
20	20	20	20 .. ·27	20	20 .. ..
21	21	21	21	21 .. ·08	21 .. ..
22	22	22	22 .. ·65	22	22 .. ..
23	23	23	23 .. ·05	23	23 .. ..
24	24	24	24	24	24 .. ..
25	25	25	25 .. ·23	25 .. ·53	25 .. ..
26	26	26	26	26	26 .. ·28
27	27	27	27	27 .. 1·90	27 .. ..
28	28	28	28	28	28 .. ..
29	29	29 .. ·31	29	29	29 .. ..
30 .. ·81	30 .. ·07	30	30	30 .. ·28	30 .. ..
	31		31 .. ·80	31	
Total .. ·81	Total .. ·55	Total .. 2·82	Total .. 3·67	Total .. 3·69	Total .. 2·10

October 1876.	November 1876.	December 1876.	January 1877.	February 1877.	March 1877.
Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
1 .. 1·34	1	1	1	1	1 .. ..
2	2	2	2	2	2 .. ..
3	3	3	3	3	3 .. ..
4	4	4	4	4	4 .. ..
5	5	5	5	5	5 .. ..
6	6	6	6	6	6 .. ..
7 .. 1·01	7	7	7	7	7 .. ..
8	8	8	8	8	8 .. ..
9	9 .. ·12	9	9	9	9 .. ..
10	10 .. 1·04	10	10	10	10 .. ..
11	11 .. 1·01	11	11 .. ·02	11	11 .. ..
12	12 .. ·02	12	12	12	12 .. ..
13	13	13	13	13	13 .. ..
14	14	14	14	14	14 .. ..
15	15	15	15	15	15 .. ..
16	16	16	16	16	16 .. ..
17 .. ·54	17	17	17	17	17 .. ..
18	18	18	18	18	18 .. ..
19	19	19	19	19	19 .. ..
20	20	20	20	20	20 .. ..
21	21	21	21	21	21 .. ..
22	22	22	22	22	22 .. ..
23	23	23 .. ·10	23	23	23 .. ..
24	24	24 .. ·03	24	24	24 .. ..
25	25	25 .. ·01	25	25	25 .. ..
26	26	26	26	26	26 .. ..
27 .. ·30	27	27	27	27	27 .. ..
28 .. ·15	28	28	28	28	28 .. ..
29	29 .. ·85	29	29		29 .. ..
30	30 .. ·70	30	30		30 .. ..
		31	31		31 .. ..
Total .. 3·34	Total .. 3·74	Total .. ·14	Total .. ·02	Total .. *Nil.*	Total .. *Nil.*

9. *Establishment.*—At the end of October, on the opening of the Agricultural College, the class of Sydapet Farm Apprentices was abolished; other than this there were no changes in the establishment, and the conduct of all the members of it was generally satisfactory.

SECTION II-A.

CULTIVATION AND CROPS.

10. *Rotations and their value.*—Experience has shown that the continuous cropping of land with one crop, or with crops of close affinity, for a long series of years successively, renders the soil unproductive. To this exception may be made of lands so situated that they annually receive a deposit of silt from some river, or of lands to which, after each successive crop, manure containing the plant food removed by it is applied. The last-named system, although capable of maintaining the land in a permanent state of fertility, has been found not to be generally economical.

Continuous cropping exhausts the land unless certain conditions are fulfilled.

11. To overcome the difficulties mentioned, the alternation of the growth of different crops was adopted, and has been proved to be most effective.

12. The theory of rotations is explained by Boussingault as follows :—

"In reviewing the chief points examined, it will be seen that, as far as regards organic matter, the systems of culture which in borrowing most from the atmosphere, leave the most abundant residues on the land, are those which constitute the most productive rotations. In respect to inorganic matter, the rotation to be advantageous, to have an enduring success, ought

to be so managed that the crop exported should not leave the dunghill with less than that quantity of mineral substances which it ought to contain."

A leguminous good preparation for a cereal crop.

13. A leguminous plant if grown before a cereal has been found to have marked effect on the succeeding crop, even if the leaves, stems and grain be removed. This is explicable from the great richness in nitrogenous matters, which are so much needed for the growth of cereals, that the roots of leguminous plants possess. A knowledge of the effect of leguminous crop, as a manure for cereals, is shown when the ryot grows a crop of black or green gram (*Phaseolus*) on wet lands for the benefit of the succeeding crop of paddy; although, in this case it may be said, that the leaves and stems are returned, and so cause the increase of production, yet, if the experiment of grazing the gram crop with sheep were tried, the result would, there is no doubt be more profitable.

A grain more exhaustive than a fodder-crop.

14. It has been proved that, when a crop is grown for seed, the soil has much more phosphorus, potassium, &c. removed from it than if the crop be grown for its leaves and stems only. Thus it is that a crop cut green for fodder does not exhaust the land so much as a crop that is allowed to mature its seed.

Variable amount of ash constituents in different plants.

15. The analyses of the ashes of different plants show that their composition is very similar in the same family, but that those of different families vary greatly. Thus the ash of leguminous crops is usually rich in lime, and that of cereals in silica. From this habit the advantages of alternating crops may be in a measure explained, as it is known that, although an analysis may show a soil to contain all the elements required for the growth of a particular crop, a further examination into the state in which these constituents exist may show that some element, especially required by the crop it is intended to grow, is only present in a condition in which it is practically unavailable in sufficient amount to produce a good crop.

Cultivation and nature change constituents of soil.

16. It is known that by the operations of cultivation, and by the forces of nature, the constituent parts of a soil become gradually changed in their composition, so that, although in one year, a piece of land may be unable to grow a *profitable* cereal crop, it may in a second be able to do so, even if, during the first year, a crop of another family be grown on it.

Root growth of plants varies.

17. Research has also shown, that the roots of different plants seek for and absorb their food in different parts of the soil, some going into the sub-soil, some only existing on the surface. By alternating crops which seek their food in different parts of the soil, it is possible to allow some portion of it to lie fallow. And here it may be remarked that the roots of plants open up and aërate the soil; if a crop be deep-rooted, by penetrating downwards it places a greater depth of soil at the service of the cultivator; if its roots be wide-spreading, they increase the organic matter in the surface, and aërate it also when they decay, thus improving the physical condition wherever they go.

Encouragement and obstacles to weeds.

18. Some crops encourage the growth of weeds, owing to the difficulties their habit of growth presents to thorough intercalture; other crops, by the dense covering they afford, kill out many weeds which would otherwise become overwhelming; again there are other crops which it is possible to cultivate, by which and weed, thoroughly during their growth. Thus by adopting rotations the land may be kept clean and be benefited by the continual culture it experiences under such crops.

Destruction of insects.

19. Some crops are attacked by particular insects, which deposit their larvæ in the ground wherever the crop on which they are feeding is growing. If the same crop be taken on this land successively it will suffer more and more from insect attacks, whilst if different descriptions of crop be grown, the insect, being deprived of its food, would probably die.

Economy of labor.

20. It is the object of every agriculturist to economise labor, and to do this efficiently, the seed-time must be extended over as long a period as possible. In temperate climates, the seed-time extends

throughout nearly the whole year. Here owing to the character of the season, it is not possible to extend the seed-time very much; but to a certain extent it is, and, in constructing a rotation for any locality, the climate, having a most important part to play as regards the Labor Bill, must be carefully considered.

An applicable rotation.

21. As a rotation for dry lands applicable to many soils; including amongst the crops suggested two of the most valuable products commonly grown in Southern India; providing an adequate supply of food for man and beast; not presenting a system of exhaustive culture, in too repeatedly growing the same crop or description of crop; and enabling the land to be kept free from weeds, the following may be suggested:—

1st year—Corn crop and cotton.
2nd year—Indigo.
3rd year—Corn crop followed by a catch crop of gram.
4th year—Guinea grass.
5th year—Guinea grass.

22. This would give annually on a 20-acre holding—

8 acres of corn.
4 acres of indigo.
4 acres of cotton.
8 acres of grass.

Crops chiefly consumed on the land.

23. The only crops in such a rotation, which would actually be sold off the land, would be the cotton and indigo; the corn crop being used for the support of the cultivator, his family, and of such laborers as he employed, would not be lost, as the ordure and rubbish from their houses might be collected and returned to the land.

Cotton provides cattle-food and fuel.

24. The cotton seed would provide food for the cattle, and if there were a surplus of corn grown, a portion might be sold and an equivalent amount of cattle food or manure purchased. The cotton stalks would provide some fuel for household use, and the ashes left from them would form a valuable addition to the compost heap.

Indigo not an exhaustive crop but manural.

25. Indigo should not be an exhausting crop under skilful management. The dye is the only product that must be removed; the refuse from the vats, consisting of nearly the whole plant, being brought back, would when rotted form a valuable manure. Indigo, the roots of which penetrate deeply, thus tending to open up and aërate the soil and so improve it, would leave the land in a condition fit to carry the second corn crop of the rotation, which however should receive a top-dressing of some manure, such as saltpetre, the value of it being recouped by a sale of a portion of the grain grown.

26. If a gram crop were grown it should be used as a manure, either by being fed off with sheep, or by being ploughed into the land green; the latter mode of manuring is most efficacious in many instances, especially when the soil is retentive or apt to set, and also when it is deficient in organic matter.

Guinea grass good fodder—under it land fallowed.

27. The two years under guinea grass might be reduced to one on many lands, and would take the place of the system now practised of leaving land "waste"; under this grass, the land would produce a good crop of fodder; be kept in continual cultivation; cleaned of weeds, and the insects and parasites which might have attacked the previous crops would die out, so that, at the end of the rotation, the land would be left in good heart to grow the first crop of the next series.

Rotation for stronger soils.

28. On stiff strong rich soils, instead of planting guinea grass in the fourth year, an early sown cholum crop, cut green for fodder, followed by a leguminous crop, such as black or green gram, which, being harvested in the early part of the year, could be succeeded by a summer crop of gingelly; in the fifth year indigo might again be taken, followed

in the sixth year by a corn crop, in the seventh and eighth years by guinea grass. The rotation would then run as follows:—

1st year—Corn and cotton.
2nd year—Indigo.
3rd year—Corn and gram as summer crop.
4th year—Cholum cut green, followed by a leguminous crop and by gingelly as a summer crop.
5th year—Indigo.
6th year—Cholum and gram as catch crop.
7th and 8th years—Guinea grass.

29. Another variation might be made, instead of indigo in the fifth year corn and cotton might be introduced, and another year added to the rotation, which would then become a nine-course one.

30. *Deep Cultivation.*—Year by year experience of the results seen on this farm confirms the opinion, "that the *value* of deep culture can, for usefulness in India, be scarcely overrated." The past year has been more fruitful than ever in facts demonstrating this point. Those fields, which were more deeply cultivated, gave better returns than others in which so deep a tilth was not obtained; and in all, the head-lands, which, owing to the constant treading of the cattle in turning, were not so deeply cultivated as the rest of the field, presented a most marked difference in the crop they produced.

Value incalculable.

31. The table given below is a statement of the results of the deep cultivation of the body of a field, contrasted with those produced by the shallow cultivation of the head lands:—

No. of Field.	During Growth. Rainfall.	During Growth. Wet Days.	Duration of Growth.	Nature of Cultivation.	Area of Plot.	Yield of Straw.	Yield of Straw per Acre.	Yield of Grain.	Yield of Grain per Acre.
16	·16	3	87 days.	Deep	SQUARE YDS. 16,027	LBS. 11,456	LBS. 3,459·6	LBS. 221	LBS. 66·7
				Shallow.	2,180	216	479·5	4·5	9·99

32. It will be seen, that from the more deeply cultivated part of the field the yield of straw was at the rate of 3,459 lbs. per acre, whilst, from the head-lands it was only about 480 lbs., or less than one-seventh; the outturn of grain was in both cases very small, but, as the head-lands only yielded at + rate the rest of the field did, the effects of deep culture are equally obvious.

Deep cultivation gave seven times more produce.

33. The whole field had been heavi manured throughout, and if anything the head-lands received more than their share the manure.

34. Seeing that the head-lands were cultivated fully as deeply and as well as is the ordinary practi of the country, this case shows what may be done, towards ening the effects of the droughts we suffer from, by adopting deeper tillage of the soil; for during the growth of this cr only ·16 inches of rain fell. The seed was sown after a week's dry weather, whic followed a full of 1·55 inches, before which there had been no rain at all for more than a fortnight. The point here brough out is of vital importance, for, if fodder could be produc in such quantities as were in the case referred to, there would never be suc errible losses of cattle, as there have been during this year. Although in this cas yield of grain was very low, during the same season with other crops planted at earlier date, and thus receiving more rain, 300 to 500 lbs. of grain per acre were p duced under similar management.

Effects of droughts intensified by shallow culture practised generally.

Fodder at least provided in case of droughts.

35. *Small and large Fields.*—A further consideration of the table given in paragraph 31 shows the advantage of having large fields instead of small; in that the proportionate area of head-lands is much less,

36. In this case, in a field of 3¾ acres, 12 per cent. of the area was taken up with head-lands, this caused a loss, from the stunted crop which grew on the head-lands, of 1,307 lbs. straw and 25½ lbs. of grain, worth about Rupees 7-8-0, or about Rupees 2 per acre. If the field had been smaller, the loss per acre would have been heavier, as the width of the head-land must in all cases be nearly the same.

Great loss of crop from small.

37. For economy of working, long and broad fields, provided they are not too long for the cattle to plough from end to end without a pause or check, are far superior to short and narrow ones, as the time consumed in turning is less proportionately to that whilst at work than in short fields.

Costly to work small.

38. In small fields the boundaries between each field occupy a considerable percentage of the area of cultivated land, whilst, if the fields are large, this area forms only an insignificant portion of the total. Every boundary, whatever it consists of, forms a nursery for weeds from which their seeds can be distributed to the land around, so that the fewer and smaller these nurseries are the better.

All boundaries need nurseries.

39. *Crops grown.*—The following table gives the outturn of several crops grown during the past season, and is worthy of notice:—

1	2	3	4	5	6	7	8
Description of Crop ..	Sorghum.	Planter's Friend.	Yellow Cholam.	Yellow Cholum.	Yellow Cholum.	Yellow Cholum.	White Cholum.
Number of Field ..	4	34	33	32	14	18	16
Area of Plot	SQ. YDS. 8,470	SQ. YDS. 6,930	SQ. YDS. 17,632	SQ. YDS. 22,990	SQ. YDS. 4,985.	SQ. YDS. 19,602	SQ. YDS. 18,207
Date of sowing ..	17th October 1875.	10th October 1876.	18th October 1876.	5th October 1876.	9th October 1876.	15th Nov. 1876.	8th Dec. 1876.
Amount of seed sown..	14 lbs.	40 lbs.	75 lbs.	25·26 lbs.	50 lbs.	76 lbs.	73 lbs.
Seed sown per Acre ..	8·00 lbs.	27·93 lbs.	20·58 lbs.	5th Jan. 1877.	22nd Jan. 1877.	1877.	19·40 lbs.
Date of reaping ..	24th Jan. 1877.	31st Jan. 1877.	15th Jan. 1877.	93 days.	106 days.	91 days.	3rd March 1877.
Duration of growth ..	100 days.	106 days.	98 days.	5·74 in.	4·75 in.	1·71 in.	87 days.
During growth—				14	14	6	·16 in.
Rainfall	4·75 in.	4·35 in.	4·75 in.				3
Wet days	13	12	13				
Yield of—				11,928 lbs.	4,985 lbs.	10,328 lbs.	11,672 lbs.
Straw	5,948 lbs.	5,600 lbs.	10,096 l	1,525½ lbs.	* 164 lbs.	480 lbs.	225½ lbs.
Grain	1,615 lbs.	650 lbs.	1,640 l				
Yield per Acre of—				2,511 lbs.	3,964 lbs.)	2,540 lbs.	3,103 lbs.
Straw	5,103 lbs.	3,911 lbs.	2,771 l	321 lbs.	*159 lbs.	118 lbs.	560 lbs.
Grain	924 lbs.	454 lbs.	450 l				

* A large amount of the produce of this field

s stolen which causes the low outturn.

40. From this statement it will be seen that crops sown early in October produced from 2,500 to 5,000 l s. of straw, and from 320 to 920 lbs. of grain; whilst others wn later, although the outturn of straw was nearly as great, s ow a great falling off in that of grain; this must be attributed to the smaller amour of rain that fell during their growth.

Fair crops produced without irrigation.

41. These results show in a great meas e what may be done, even on light soils like that of this fari , to produce crops with even as light a rainfall as there was uring the past year. The results may be attributed to the epth of cultivation, the value of which in a droughty season has already been dwelt upon, and to the manuring which all the fields received. In order to understand and appreciate the results shown in the statement, some remarks regarding each crop are given here.

Result attributable to good system of culture.

42. The Sorghum crop was grown on a piece of light sandy loam, which had lain fallow during the previous year and was heavily manured with box manure; the crop was also top-dressed with saltpetre, and, to the thoroughly cultivated and high manural state of the land, the result obtained may be attributed. It will be seen that the seed sown was as little as could possibly be used with any good results, but it is probable

that, had the crop been slightly thicker on the ground, the results would have been better.

43. The crop of Planter's Friend was grown on a light soil of average quality, which had been extremely well cultivated: it only received as manure a top-dressing of saltpetre.

44. The two Yellow Cholum crops first on the table were grown in adjacent fields of similar quality; the difference in outturn may be attributed to the first field having been more thoroughly cultivated, and to the fact that the crop in it succeeded one of indigo; whereas in the second field the cholum followed a crop of maize and cotton, and further that in this field there were several more trees, which always cause a considerable diminution of crop on the land immediately surrounding them.

45. The third crop of Yellow Cholum was grown in a field, of very similar quality to the last, which had been most thoroughly cultivated, and had received a good dressing of manure.

46. The last crop of Cholum on the table was grown on a light sandy field, which had been heavily manured with horse manure, and was top-dressed with a dressing of salt and dissolved Peruvian Guano. It should be observed how little rain this received during its growth, but in connection with this it must also be noted that, five days before the crop was sown, there was a fall of over 2 inches, which saturated the seed-bed, and thus enabled the seed to germinate.

47. The crop of White Cholum sown on December 8th is really a most wonderful crop, considering that during its growth all the rain it received was ·16 inches. The land was in good condition from deep cultivation and a heavy manuring of horse manure.

48. The following is a statement of the actual cost of production, and a valuation of the outturn, of the crops referred to in the table given in paragraph 39, excepting that grown in No. 14 field, which it is useless to include owing to the pilfering of the produce which took place:—

Crop.	Sorghum Saccharatum.	Planter's Friend.	Yellow Cholum.	Yellow Cholum.	Yellow Cholum.	White Cholum.
Field grown in	No. 4.	No. 34.	No. 33.	No. 32.	No. 18.	No. 16.
	sq. yds. 8,470	sq. yds. 10,890	sq. yds. 17,632	sq. yds. 22,990	sq. yds. 19,602	sq. yds. 15,207
Area	Rs. A. P. 1 12 0	Rs. A. P. 1 0 0	Rs. A. P. 2 8 0	Rs. A. P. 4 0 0	Rs. A. P. 2 8 0	Rs. A. P. 5 0 0
Cost of seed	24 6 0	1 0 0	41 12 6	45 12 6	26 0 0	41 15 6
Labor in cultivation, &c.	5 15 6	3 0 0	15 3 0	17 13 0	12 5 0	9 11 0
Do. in harvesting, &c.	31 15 6	3 0 0	63 7 6	65 9 6	39 13 0	56 10 6
Labor and seed	13 4 3	1 0 0	16 9 7	13 12 11	9 13 3	8 14 6
Do. do. per Acre	21 9 0	7 0 0	19 2 8	19 15 0	28 12 0	33 8 0
Cost of Manure	36 6 9	3 0 0	3 4 3	4 2 2	8 14 6	8 14 6
Do. do. per Acre	30 3 6	3 0 0	46 6 2	47 11 4	7 1 5	46 10 0
Value of Seed	30 3 6	3 0 0	11 1 4	10 7 8	41 4 11	12 5 5
Do. do. per Acre	25 12 0	2 12 0	24 10 8	20 10 7	10 3 2	9 0 0
Value of Grain	17 6 3	1 8 0	16 0 1	19 3 3	16 0 0	2 6 3
Do. do. per Acre	46 2 3	4 0 0	43 0 10	21 2 3	3 15 2	55 10 8
Gross Outturn	119 11 6	11 0 0	76 1 5	83 6 6	57 4 11	14 11 0
Do. do. per Acre	84 7 6	7 0 0	69 13 10	17 15 1	14 2 4	80 2 0
Gross Cost	85 4 0	7 0 0	21 13 10	9 14 0	68 9 0	17 13 0
Do. do. per Acre	61 4 0	7 0 0	9 2 8	3 1 0	15 14 8	16 13 0
Value of Manure carried to next crop.	13 9 6	1 0 0	3 10 0		14 6 0	4 7 0
Do. do. per Acre.					3 8 0	

49. The total area of the crops referred to is 19·39 acres. The gross cost was Rupees 454-15-2; [illegible] about Rupees 23-8-0 per acre, of which Rupees 9-3-0 was for the manure applied, and Rupees 14-5-0 for labor and seed; the cost of manure, it will be seen, varies in different cases from Rupees 4-2-2 up to Rupees 30-3-6 per acre, and the cost of labor and seed from Rupees 9-14-6 to Rupees 18-4-3.

Gross return.

50. The gross return per acre varies even more than the cost of production, for, though the average is Rupees 18-13-6, the crop of sorghum returned Rupees 63-8-6 and that of yellow cholum in No. 18 only Rupees 14-2-4 per acre.

51. The average gross return is less than the gross cost of production, but, if a valuation of the manural matters left in the soil after the first crop be deducted from the cost of production, it will be seen that a small balance per acre is netted; this, it must be remembered, is after paying a high price for hire of cattle and for cooly labor. Of the sum expended on labor, at least 50 per cent. would under ordinary circumstances represent the value of the labor of the ryot and of his family; this amount being the remuneration he would receive in growing such crops. It is further questionable whether the full cost of the labor expended on the crops referred to can be fairly charged to them, for a great deal of cleaning the land was done, the effects of which will not be lost for some time. The rates at which the produce was valued were, yellow cholum 30 lbs. per Rupee, straw 250 lbs. per Rupee, excepting in the case of sorghum a portion of which weighed green was only valued at 300 lbs. per Rupee, sorghum seed 20 lbs. per Rupee, and the planter's friend and white cholum seed 25 lbs. per Rupee; these prices are all exceedingly moderate for the season. And in reality, straw was at the time unobtainable for double the price named, and grain has since attained a much higher figure, and which could have been obtained if a market had been waited for.

Terms of valuation which are very low.

52. Maize (*Zea Mays*).—A plot measuring 2,418 square yards, was sown with this crop; and, under occasional irrigation, it produced, between November 8th and February 6th, 6,198 lbs. of fodder, which is at the rate of 12,226 lbs. per acre. The rainfall during the period of the growth of this crop was 3·90 inches, and it received 8 waterings; it was manured with about 12 loads of stable manure, and received a top-dressing of 50 lbs. of saltpetre.

Heavy crop of fodder.

53. Cotton (*Gossypium Indicum*).—The season prevented the usual sowings in September from succeeding, and it was not until nearly the end of November that any crop that was sown grew well; a plot sown then has thriven wonderfully, and, aided by the deep tillage of the land on which it is growing, been able to withstand the drought, yielding fairly—though of course not so heavily as it would in a good season; as the season is not completed the full details of the crop will be given in the next report.

Season unfavorable for, but fair crop obtained.

54. A point, which should have a most material influence on the selection of the seed-time for cotton, has until now received no attention; it is the period of the year during which the yield of lint from the cotton plant is greatest. As bearing on this point, in the statement given below, the results of the different ginnings of the cotton gathered during the season of 1876 are recorded:—

Period of greatest yield of lint not inquired into most important.

Date of Ginning.	Amount Ginned.	Amount of Lint.	Percentage of Lint.	Details of Gatherings.
	Lbs.	lbs.		128 lbs. gathered before 1st January.
28th February 1876 ..	445·5	154	·57	102·5 lbs. do. do. in January.
				115 lbs. do. do. in February.
				53 lbs. do. do. in do.
12th May ,, ..	602	220	·55	251 lbs. do. do. in March.
				298 lbs. do. do. in April.
				32 lbs. do. do. in do.
17th do. ,, ..	181	58	2·04	169 lbs. do. do. in May.
16th June ,, ..	146	48	·88	Gathered between May 16th and June 10th.
18th July ,, ..	372	98	·34	Gathered after June 10th.
4th August ,, ..	246	40	·07	Gathered after July 18th.
16th do. ,, ..	212	59·5	·07	
24th do. ,, ..	197·5	52	2·33	
1st September ,, ..	187	58	3·02	Gathered after August 24th.
25th do. ,, ..	72	21·5	2·86	
Total ..	2,661·0	809·0	3·40	

55. It will be noticed that there is a great variation in the yield of lint at different times of the year, the cotton gathered during the earlier months yielding a much higher percentage than that picked later on. Thus the percentage of lint in

the cotton gathered before June 10th was 34·92, and, in that which was gathered between June 10th and the end of August, it was only 24·28, or about 10½ per cent. less. The yield of cotton in seed, during the first of the above-named periods, was 74·75 per cent. of the total gathering. The gatherings in September show a very high percentage yield of lint, but, as it was an unseasonably dry month, especially after the first week, the outturn in it must be taken as exceptional.

Percentage highest in early months as well as greatest yield.

56. Looking at the rainfall of the four months—May, June, July, and August—it will be noticed that one inch less than the average of the past sixty years, or more than 3 inches less than that of the past ten years, was registered; the chief difference being in the fall during the month of May, so that the long dry season was rather more protracted than usual; no rain fell from December 17th of 1875 until April 30th, 1876, when, after a drought of about eighteen weeks, ·81 inch fell, followed by four slight falls before June 10th amounting in all to 1·30 inches, which falls, considering the temperature of the air, and the dryness of the soil at the time when they fell, could have little permanent effect.

57. From the results of the ginnings recorded, it appears that after July it would generally be undesirable to keep cotton on the land; for, not only is the outturn shown to be chiefly given in the early months of the year, and that the percentage of lint produced after June is low, but also, during the showery weather of July and August, it is most difficult to keep down the weeds, and in all probability, if the crop is kept on the land for a longer period in the hope of obtaining rather more yield, the succeeding crop will be endangered, and great expense will be necessitated to clean the land again.

Advisable to remove cotton after July.

58. It would be better to sow the cotton crop at an earlier date than has been customary; instead of September, August should be the month chosen; by this means, cotton-picking might begin at the end of December, instead of the end of January or the beginning of February which has been until now the usual season. By this means a longer gathering season during the early months of the year, when the percentage of lint is greater, the staple longer, the sample usually much cleaner and not stained with oil, would be obtained, and the temptation to keep the crop on the ground late in hopes of obtaining a further gathering would be lessened.

August sowing will give a longer gathering season.

59. Indigo (*Indigofera tinctoria*).—The growth of this valuable crop is attended with considerable difficulties. The seed-time, adopted on this farm, is usually characterised by very uncertain weather, and the difficulty, in obtaining as good a seed-bed for the seed as is requisite, is great, as well as the chance of a heavy fall of rain caking the surface of the ground, and thus preventing the young germs from coming through. When a fair plant has been secured, there is no crop that we possess more hardy and less subject to the influence of dry weather than indigo. Three cuttings can be easily taken from it during the season, and it can be removed in August or September in time to allow the land to be prepared for another crop.

In first stage growth difficult plant hardly.

60. On the 11th of December, a field of about 4 acres was sown with this crop; and, although the drought prevented a good even plant being secured over the whole field, the outturn has been most satisfactory, and points clearly to the good effects of deep cultivation. The crop was not weeded, and received during the first five months it was up the ground ·16 inch of rain only. Full details of the crop will be given in the next report, for as yet the returns have not been all realized, but it may be remarked that the first cutting, which was reserved for that purpose, yielded 913* lbs. of seed, and the second 13,475 lbs. of green indigo which was sold for Rupees 34.

SPECIAL CROPS.

61. Locust or Carob Bean (*Ceratonia Siliqua*).—In 1866 some seedlings of this tree were obtained and planted on a piece of land in a good situation on this farm; but until this year they never produced any fruit. There are now 5 trees, only one of which, however is a female one.

Four years ago

* Valued at Rupees 41.

62. The trees were planted in a line, which arrangement, owing to the habit of the tree, is unadvisable, and might have explained the reason why no fruit had been produced before, were it not that the solitary female one has at last done so.

63. The risk which must always attend planting the tree, owing to its being dioecious (the male and female flowers being borne on separate trees), and there being no method of ascertaining the sex of the plant until it flowers, is forcibly illustrated in this case, as of five trees planted only one of them has turned out to be a female one. To overcome this, grafting the seedling should be adopted, as by grafting from known female and male trees, a certainty as regards the sex of the trees can be depended on; the grafts thus raised can afterwards be planted out at convenient distances, allowing a large number of female plants to each male one.

Tree dioecious—planting risky unless seedlings are grafted.

64. The trees growing here are about 17 feet high, and the stems, at 1 foot above the ground, measure about 20 inches in circumference, but for the last few years they have made no apparent increase in size; this can scarcely be attributed to the climate, for the trees do not seem to suffer even in the hottest weather, but is probably due to the fact that the soil on which they are growing is deficient in lime.

Trees small and make no progress.

65. The following extract from a paper by Dr. A. Voelcker, F.R.S., shows the nutritive and fattening qualities of the pod as a food:—

"Locust-meal, as will be seen by the following analyses of three samples analysed in my laboratory, contains in round numbers fully half its weight of sugar, and in consequence is very palatable and much liked by horses, sheep, and cattle.

"Composition of Locust, Carob-Bean, Meal.

—	No. I.	No. II.	No. III.
Moisture	17·11	12·61	14·22
Oil	1·19	1·08	·96
Sugar	51·42	50·30	54·07
Mucilage and digestible fibre ..	13·75	20·13	14·41
* Albuminous compounds	7·50	5·87	7·72
Woody fibre	6·01	7·14	5·88
Mineral matter (ash)	3·02	2·87	2·74
Total ..	100·00	100·00	100·00
* Containing nitrogen ..	1·20	·94	1·25

"In addition to the constituents mentioned in the preceding analyses, carob-beans contain variable quantities of butyric acid, which impart to the crushed beans or meal a peculiar flavor. The meal is deficient in albuminous compounds, and for this reason it is desirable not to feed cattle too freely upon it, but to mix it with peas, bean-meal, or decorticated cotton-cake, or similar feeding materials rich in nitrogenous compounds."

From the qualities that this extract shows it to possess, it is more suitable for use as a condiment than as a food for cattle and sheep. The same authority writes as follows regarding the hard seeds enclosed in the sweet pod referred to above:—

Useful as a condiment.

"The seeds are very hard and in an unbroken state very indigestible. However, when split and steamed for some time, they swell out and get soft, and in this condition may be given to cattle with advantage as a useful fattening food. A sample of locust-bean kernels or seeds recently analysed by me had the following composition:—

Moisture	11·19
Oil	·97
*Albuminous compounds (flesh-forming matters)	5·94
Mucilage, sugar, and digestible fibre	76·29
Indigestible woody fibre	3·62
Mineral matter (ash)	1·99
Total ..	100·00
*Containing nitrogen	·95

66. Buck-wheat (*Polygonum Fagop rum*).—A plot of 1,300 square yards was sown with this crop, the seed having been obtained from Australia. It grew well and would in an ordinary season doubtless tain maturity without being watered, but in the present case it was necessary to do).

67. The seed was sown on November 9th, and within ten weeks the crop was off the ground, leaving it ready for another. The yield was at the rate of grain 167 lbs., straw 1,136 lbs. per acre; but, under more favorable circumstances, it would, there is every reason to believe, yield better results.

68. The crop is useful as a preparation for a cereal, or as a green manure. The fodder is good food for cows, and the grain yields, after the husk has been removed, a meal rich in nutritive matters. As an alternative crop with the cereals, as a catch crop after an early one grown for fodder, or grown as manure, buck-wheat can be recommended.

Useful Crop.

69. Flax (*Linum Usitatissumum*).—Seed of this plant also was obtained from Australia, and was sown on a piece of land adjoining the last crop referred to. It grew well, and was very healthy, but did not attain great length (only about 21 inches), as it was sown at wide intervals for the seed.

70. Vetches (*Vicia Sativa*) and Rape (*Brassica Napus*).—Australian seed—were sown, but, although the seed germinated well, neither crop succeeded. The vetches were apparently unable to withstand the heat, and the rape was attacked by caterpillars.

71. A plot of Lucerne (*Medicago s tiva*).—Australian seed—was also sown, and has done well, but as the crop was kept r seed, no outturns have been recorded of it.

72. Two samples of wheat were o tained from Egypt, but, though they germinated and grew fairly at first, no grain was produced; this may have been owing to want of sufficient water, to a higher temperature than is usual in Egypt, and to the lightness of the soil on which the crop was sown.

73. Samples of lentils and lupins were also obtained from Egypt, but did not succeed, although they germinated well.

HEDGE PLANTS.

74. Osage Orange (*Maclura Aur tiaca*).—The plants referred to in the last report, paragraph 179, as having been sed and doing well, nearly though not totally succumbed to the last hot season, but sidering the duration and severity of it, the experiment is worth continuing, and me plants raised from another supply of Australian seed are now doing well.

75. *Kangaroo Thorn.*—Some seed this plant, which is used to a considerable extent as a hedge-plant in Australia, s obtained, and a number of young seedlings raised from it are now doing well in th nursery. The plant appears to promise well, being covered with numberless small s es, and growing fast; it remains to be proved whether the extreme heats of this coun will not be too great for it, and also whether the spines are sufficiently strong to pre nt cattle from straying through a hedge of it.

76. The thorny shrub, referred to paragraphs 154 and 155 of the last report, is doing fairly well; a large percentage of the cuttings obtained grew and rooted thoroughly; but the season has been ag inst hedge-planting, so that further trials of it have not been made. The fences plan d under the system mentioned in paragraph 157 of the same report are doing well, d, notwithstanding the season they have had to contend with, have formed fences fa perior to what could be obtained in so short a time, if started from seed.

SECTION II-B.

MANURES.

77. *Top-dressing experiments.*—The results given in the following table, of a set of experiments made with top-dressings during the past season, are interesting and, notwithstanding the unpropitious character of the season for such, demonstrate several points very clearly:—

—	Produce.	Unmanured.		Saltpetre. Value per Acre, Rs. 12.		Saltpetre and Bone Charcoal. Value per Acre. Saltpetre Rs. 6, Bone Charcoal Rs. 6.		Bone Charcoal. Value per Acre, Rs. 12.	
		A.	B.	A.	B.	A.	B.	A.	B.
Yield of Plot	Straw	lbs. 884	lbs. 1,348	lbs. 1,332	lbs. 1,534	lbs. 1,197	lbs. 1,402	lbs. 1,010	lbs. 1,179
	Grain	112	108	124	118	105	124	110	95
Yield per Acre	Straw	3,536	5,392	5,328	6,136	4,788	5,608	4,040	4,616
	Grain	448	432	496	472	420	496	440	776
Increase per Acre over unmanured.	Straw	..	..	1,792	744	1,252	216	504	— 776
	Grain	..	..	46	30	— 28	64	— 8	— 52
Value of Increase per Acre.	Straw	..	..	Rs. A. P. 9 1 8	Rs. A. P. 4 2 11	Rs. A. P. 3 14 8	Rs. A. P. 3 6 7	Rs. A. P. 1 11 2	Rs. A. P. — 5 5 2
	Grain								

78. The crop to which the top-dressings were applied was yellow cholum, following a heavily manured crop of maize and cotton; it was sown on 5th October, and the manures were applied on the 20th of the same month; during the whole time of growth, 193 days, there was only a raini ll of 5·74 inches in 14 days, and of this 1·59 inches fell before the 20th. The soil o which the crop was grown was a light sandy loam, not in very good condition. T e seed was sown at the rate of 25 lbs. per acre and germinated well.

79. It is interesting to note here that in Coimbatore District* on soils, none of which were so inferior as the one on which this crop was grown, in an ordinary season a crop of about 450 lbs. of grain is as much as can be expected per acre, which amount was attained without the use of top-dressing in this case.

Good crop for droughty season.

80. The reason why in the B series the yield of straw should be more in every case than that in the A series, is hard to explain, excepting by the fact that the previous crop of maize had been more vigorous on the portion of the field in which the latter series were grown.

81. The utility of saltpetre as a top-dressing is shown, though not so clearly as it would have been had the season been wetter and more conducive to vigorous growth; although the increased return did not recoup the value of the manure applied, it is probable that there were manural matters of more value left in the soil than are required to make up the deficiency.

Saltpetre useful top-dressing.

* *Vide* paragraph 138 of the Report of Superintendent of Government Farms on Coimbatore District for 1875.

82. Bone charcoal by itself is shown to be useless as a top-dressing, and from its insolubility in water this might be expected; but the effect apparently caused by it in Series B must be attributed to some cause in the soil on which the plot was situated, and not to the manure applied.

Bone charcoal inert.

83. The effects of a light dressing of saltpetre, at the rate of Rupees 6 per acre, mixed with bone charcoal, were better than those obtained with a heavy dressing. And seeing that the action of bone charcoal is apparently *nil*, the increase shown must be put down solely to the saltpetre; which however, though it does not recoup the full expenditure immediately, shows that the application of a dressing of medium quantity will be more certain of being repaid in the crop produced.

Light dressing more remunerative.

84. Another set of experiments, with dissolved guano as a top-dressing was made, but, owing to a large amount of the grain having been stolen from the field, the results cannot be reported; judging, however, from the yield of straw on the different plots this manure does not materially increase that portion of the produce.

Set of experiments ruined by pilfering.

85. Lime (*Calcium Carbonate*).—The use of this mineral as a manure in native agriculture is totally overlooked, and perhaps fortunately so; for if the ryot knew the stimulating qualities of a dressing of lime on the soil, he would soon deprive it of the small reserves of plant-food it contains, and leave it utterly barren. The mineral is easily obtainable in many localities and might be applied to some soils with great advantage, but it is not to be recommended for use except under enlightened management, for it has long been said of lime that "it enriches the father and impoverishes the son," in this referring to the use of it in excess. As a manure for leguminous crops it is very valuable; and its effects, on a crop of ground-nuts grown on the farm, were most marked, for it increased the yield of nuts 83 per cent. and that of straw 10 per cent.

Not used in native agriculture.

Great effect on crop of ground-nuts.

SECTION III-A.

LIVESTOCK.

86. *Cattle.*—To form a commencement of the stock-breeding experiment, referred to in paragraph 46 of the last report, four young bulls and three heifers were obtained in November from the Amrhut Mahal herds. The cattle of these herds are chiefly noted for their qualities as draught animals. The specimens received, which were selected ones, are of slight make and very deficient in depth and thickness, but from their activity are able to perform light work with rapidity.

87. Owing to the drought it was impossible to lay down the land under guinea grass which it had been intended to; and even had means been available for keeping good stock on the farm, the presence of the Commissariat slaughter-houses in its midst renders such a proceeding unadvisable, from the risk that would be run of importing disease into the herd.

Stock-breeding experiment delayed.

88. *Measurements of Cattle.*—The following table gives the measurements of some of the cattle of different breeds that are among the farm stock; and it should be borne in mind that all the cattle were rather low in condition when measured, excepting the old Aden bull.

Breed.	Age.	Height.				Girth.		Horns.			Weight.
		Behind hump.	At loins.	At set on of tail.	To breast bone.	Behind shoulder.	At flank.	Girth at bore.	Width between.	Length.	
		Ft. In.	Ft. In.	Ft. In.	Ft. In.	Ft. In.	Ft. In.	Ft. In.	Ft. In.	Ft. In.	lbs.
Half bred bull { Nellore / European. }	Aged.	4 8	4 9½	4 6	4 11	6 3	6 11	0 11	0 3	1 3	654
Aden bull	do.	4 0½	4 3	4 1	4 9½	5 8½	6 5	0 11	0 2	0 11½	1,160
Do.	3	3 7	3 9½	3 6	3 7½	5 0	5 6	0 8	0 2	0 6	847
Do.	2	3 7½	3 10	3 7½	3 7	4 8	4 11	0 8	0 2	0 4½	621
Mysore bull "dark" ..	6	4 1½	4 2	4 0	4 0½	5 4	5 6	None present.			491
Do. "light" ..	6	3 11½	4 1½	4 3	4 7	5 3	6 0	0 11	0 2	1 6½	662
Do. "black" ..	4	3 8	3 10	3 9	3 10	4 5½	4 8	0 11	0 3	1 3	654
Do. "speckled" ..	4	3 7	3 10	3 7	3 9	4 1½	4 3	0 8	0 2	0 11½	1,160
Buffaloe bull "Guzerat black"	Aged.	4 7	4 6	4 3	4 3	5 6	5 9	0 10	0 2	1 0	847
Do. "Guzerat brown"	do.	4 7	4 7	4 3	4 3	5 9	6 3	1 2	0 10	1 2	1,219
Aden cow	do.	3 7½	3 9	3 6	3 6	4 8	4 11	0 10	0 4	0 11	911
Mysore heifer	4	3 6½	3 9	3 10	3 10	4 8	4 11	0 9½	0 2½	0 10	490
Do.	5	3 6½	3 11	3 10	3 10	5 1	5 3	0 10	0 2	1 4	440
								0 8½	0 2	1 4	430

89. In all the cattle it will be observed that they stand higher at the loins than behind the hump; this may be an advantage for draught purposes, by enabling them to throw more weight against the yoke.

Fore quarters low.

90. The length of leg, in proportion to the depth of barrel, is brought out very clearly by the measurement of the height to the breast bone, and is an excessive and general defect in the cattle of the country. To further demonstrate this point, the table below gives the comparison in several instances:—

Excessive length of leg.

—	Black Bull.	Old Aden Bull.	Six years old Mysore Bull, dark.	Six years old Mysore Bull, light.	Black Buffalo.
Total height	100	100	100	100	100
Height to breast bone ..	41	44·3	47·2	40	38·2

From these figures the legginess of some of the Mysore cattle may be seen, and also the depth of barrel of the buffalo bull.

91. In the following table the height of several animals is compared with their girth, and it will be seen that, though the Aden bull is rather leggy, he is also of good girth, showing that his barrel is round, and that he is *thicker through in proportion* to his size than either the light-colored Mysore bull or the half-bred black bull:—

—	Black Bull.	Aden Bull, aged.	Mysore Bull, 6 years, dark.	Mysore Bull, 6 years, light.	Black Buffalo Bull, aged.
Height	100	100	100	100	100
Girth	130·3	141·2	128·6	132·6	149

92. It is further interesting to note that the girth of the Aden bull, which is comparatively speaking considerable, when contrasted with that of English breeds, shows how small the cattle of the country really are. As an instance, it may be quoted that the prize bull-calves of the Devon, Hereford, and Short-horn breeds, shown at Warwick in 1859, girthed 5 feet 1 inch, 6 feet 1 inch, and 5 feet 9½ inches respectively; the animals from which these measurements were taken were of course in high condition, but, when their age is considered, the contrast is very marked.

Girth compares badly with that of English breeds.

93. *Sheep.*—The management of the sheep flock has been the same during the past year as formerly, and has been most successful. The percentage of deaths, as shown by the following table, is remarkably low, for it will be seen that, with a flock nearly one-fourth larger than the average of the past three years, the death-rate has been less than half as great:—

Death-rate very low.

—	1873-74.	1874-75.	1875-76.	1876-77.
Average number of flock ..	7	221	237	275
Number of deaths ..	6	24	21	11
Percentage of deaths ..	7·73	10·9	8·9	4
Rainfall of year	48·07 inch.	68·98 inch.	38·14 inch.	20·88 inch.

94. The influence of the rainfall on the death-rate is very great; and in a dry year like the past one, as long as sufficient food could be provided for the sheep, the absence of those disorders of the bowels caused by eating the hastily-matured grass, which grows so rapidly during the usual monsoon rains, keeps it low. In 1874-75, which year was marked with the heaviest rainfall of the four referred to in the table, it will be

Absence of rain good for health of sheep.

noticed that the death-rate was highest, which is attributable to the presence of the disorders before mentioned.

95. The following table brings out many interesting facts regarding the condition of the flock as at present constituted:—

Rams.				Ewes.			
No.	Age.	Average Weight.	Average Yield of Wool.	No.	Age.	Average Weight.	Average Yield of Wool.
38	Lambs	28 lbs.	Not shorn.	27	Lambs	25·6 lbs.	Not shorn.
31	Shearling ..	47 ,,	1·76lbs.	34	Shearling ..	39·6 ,,	1·6 lbs.
16	2 Shear	66 ,,	2·28 ,,	23	2 Shear	48 ,,	1·77 ,,
8	3 Shear	69·13 ,,	2·25 ,,	6	3 Shear	48·3 ,,	1·58 ,,
15	Aged	69·7 ,,	1·78 ,,	78	Aged	53·55 ,,	1·29 ,,
70	Average	58·74 ,,	1·94 ,,	141	Average	49·05 ,,	1·45 ,,
				Average of 211 sheep of all ages ..		52·27 lbs.	1·62lbs.

96. These figures show that the rams, excluding this year's lambs, averaged in weight 9·69 lbs., or 16·5 per cent. more than the ewes; the greatest difference in weight being in the shearlings, where the rams are as much as 37 per cent. heavier. It also shows that up to the age of 2 years the sheep increase considerably in weight, but that after that age there is very little material alteration.

97. As might be expected, seeing that early development is generally the most rapid, there is a greater difference between the weights of the shearlings and the lambs than between that of the sheep of any other two consecutive years; in this case the shearling rams are 68, and the shearling ewes 55 per cent. heavier than the ram and ewe lambs respectively, whilst the 2 shear are only 40 per cent. heavier than the shearling and 4½ per cent. lighter than the 3 shear rams, and the 3 shear ewes are almost the same weight as the 2 shear, and the latter only 21 per cent. heavier than the shearlings. These facts only show how necessary it is to give strong nourishing food to sheep under 2 years of age, if it is desired to obtain well-formed and well-grown stock.

98. The wool produced this year shows on the whole an improvement in quality, and the sheep are far better covered, there being an absence of the bare necks and breasts that were formerly so common. The value of the wool in the local market has increased considerably, for instead of only 1½ Annas per pound, the rate obtained in 1871, this year 2½ Annas were realized, showing an increased value of 66 per cent. The amount of yield per sheep does not average quite as high as a clip did in 1871, when 120 sheep averaged 1·81 lb.; this is probably due in a great measure to the scarcity of grass with which this season has been characterized, whilst the number shorn is in this case nearly double.

Quality of wool improved.

99. Returning again to the table given in paragraph 95, it will be seen that for every 10 lbs. of live weight, the sheep produced on an average 4·95 ounces of wool, an amount which compares not unfavorably with that yielded by the English short-wolled breeds of sheep. In the following table the yield of wool per 10 lbs. live weight of the different sexes at various ages is given:—

Yield for weight good.

—	Shearlings.	2 Shear.	3 Shear.	Aged.	Average.
	oz.	oz.	oz.	oz.	oz.
Rams	5·99	5·53	5·21	4·09	5·28
Ewes	6·46	5·90	5·23	3·85	4·73

100. This table shows that of the whole flock the shearlings clip heaviest for their weight; and that as the sheep develope, the yield of wool does not increase in propor-

tion to their size. The greatest yield
2 years, increasing up to that age, and r
the case of the rams and of the ewes.

f wool is apparently given at the
aining stationary or lessening after,

101. *Poultry.*—The fowls and duck
last report, have had in general perfect
lings there has been a great mortality.
ously for nearly six months ceased, and h
the extreme heat having apparently h
recovered, although their general health

referred to in paragraphs 49 and 5
alth, but amongst the chickens one,
he Pekin ducks after laying al
e not again commenced to lay
n too great for them, as th
s been good.

and duck
most continu
of the to any extent,
parison ey have never

102. The following poultry and e
Presidency during the year :—

's have been sent to differe
t parts of the

	Poultry.	Eggs.
Brahma Dorking	48	146
Half-bred Fowls	25	146
Ducks	9	19
Total ..	82	311

103. The poultry yard was rearran
with shade trees; these arrangements w
fowls as well as young chickens, the fen
the poultry protected from the sun.

d, extended, laid down in turf
conduce greatly to the health
rature of the yards being mu
lso t
h the
lso
ropos and planted
blace of imported
ch lower and

SECTION III-B.

FOODS AND FEEDING.

104. *Feeding.*—In selecting food fo
Conditions and objects must be known.
be borne in mind
and the object wi

ny kind of stock, the following p
he species and age of the animal
which it is being fed.

it points must
all to be fed,

105. Thus, the ox can digest more
the pig seems incapable of digesting i
require a bulky food, and a considerabl
not require so large an amount of food,
tion to their size.

oody fibre in a food than the she
t all; cattle from the size of their
mount of water; sheep, on the co
do they require so much water,

eep, whilst
se stomachs
ntrary, do
in propor-

106. The pig has been proved to
it into his structure, and thus fattens
foods.

e the most use of his food in ass
ily and quickly, and repays the u

imilating
e of rich

107. If animals are young and in
concentrated supply of food for their
highly nitrogenized food for the develo
it a larger amount of its mineral consti

rowing state, they require a larger
e than older animals. They require
ent of their tissues; and they extra
uts for the formation of their bones, &c.

and more
a more
t from

108. In fattening cattle and she
minimum, and the object is to increase
oil, starch, gum, sugar, &c., produce th

, when the wear and tear is reduced to a
e amount of flesh and fat, substances rich in
best results.

109. Milch cattle should always b
Green fodder good for milch cows.
an increase in
production of b
containing a hig
increasing the amount. Should chee
crops, such as gram, owing to the fac
nitrogenous part of milk), will cause a

iberally fed with green fodder, as it causes
e quantity of the milk produced. If the
er be the object in view, the use of foods
percentage of oily matters has an effect in
be the desideratum, the use of leguminous
hat cheese is chiefly composed of ca
ncrease of the constituent required.

ch (the

FOODS.

110. *Chaffing.*—The practice of chaffing fodder for cattle has been regularly
Chaffing most beneficial.
practised here with the best results. It is a most economical arrangement in preventing waste, which always occurs when cattle are fed on long straw. It enables cattle to be kept in good condition on a smaller allowance of food, as they do not tread into manure any appreciable amount of chaff, and also as their food is in a finer state of division, the cattle are able to assimilate more of what they eat.

111. *Ground-nut Cake*—is still the auxiliary food used; and although, as has been the case with all other food stuffs, there has been a very great rise in the price of it, it still remains the cheapest food procurable. In 1870, this cake was obtainable at
Great rise in price.
the price of about 90 lbs. per rupee, at the commencement of the present year, the rate paid for it was about one rupee for 73 lbs., or an increase in price of nearly 19 per cent.; this may be attributed to the increased demand of the cake for export. The contractor who was supplying the cake, failed to fulfil his contract after December, and since then cake has been obtained in the open bazaars at an average price of about one rupee for 45 lbs.

112. The value of the cake as a feeding stuff has already been clearly shown, and
Most valuable feeding stuff.
the longer it is used the more valuable does it prove. The following analyses of the oil-cake made from the ground-nut are interesting :—

Constituents.	Professor Church.		Professor Tuson.*		Dr. Voelcker.	Dr. Anderson.	Average Composition of Linseed Cake.
	Decorticated.	Undecorticated.	Decorticated.	Undecorticated.		Average of two.	
Moisture	9·2	8·1	9·58	9·23	10·80	10·84	12·0
Oil	5·6	8·8	7·40	6·99	28·62	9·80	11·5
Albuminoids	43·4	30·5	42·51	32·81	18·86	30·33	29·7
Carbo-hydrates	31·4	27·8	27·03	23·87	29·09	45·50	27·8
Indigestible fibre ..	5·2	19·1	7·87	28·30	‡ 4·51	3·53	12·0
Ash	5·2	5·7	4·71	3·45			† 7·0

* Containing sand 1·4.

‡ Containing potash 1·65, ph ate of lime 6·92.

† Containing phosphates 1·15, phosphoric acid ·80.

113. Judging from the analyses, given Professors Church and Tuson, of cakes made when the seed is husked and unhusked, ose of Dr. Vœleker and Dr. Anderson referred to samples of undecorticated cake. omparing the analyses with that of a sample of linseed oil-cake given by Dr. Vœlcl the cake will be seen to be not quite so rich in oil and therefore not so well ada for fattening purposes, but, as the means of expressing the oil from the seed in is coi try are very inadequate, in all probability the percentage of oil is much hig er, so that this objection disappears; the high percentage of nitrogenous matters e plains why it is so useful a food for working cattle.

114. Further it may be observed tha the high percentage of nitrogenous compounds in the cake uses great increase in the value of the manure made by animal fed on it; for it is calculated by the best authority on the ubject, Mr. J. B. Lawes, of Rotham-
Cake fed increases the value of manure.
stead, that the loss of nitrogen in the consun tion of cake is about one-tenth of that which it contains, the rest passing off in the n nure.

115. The ground-nut cake met with her is always decorticated; the husks are used as fuel, and the ashes therefrom, which mount to ·7 per cent. of the total crop, are generally thrown away; which, as the foll wing extract shows, is a most wasteful practice :—

"The ash of the seed consists of salts wholly soluble in water, they being phosphates of the alkalies, with traces of alkaline chlorides and sulphates. The phosphoric acid is chiefly united with potassa. The ash of the husk differs containing chiefly common salt, and phosphates of lime and magnesia."

SECTION IV.

IMPLEMENTS, MACHINES AND TOOLS.

116. *Swedish Ploughs.*—It was stated, in paragraph 191 of last year's report, that arrangements had been made to obtain some specimens of iron ploughs of Swedish manufacture; early in March 28 specimens of 14 different descriptions of ploughs were received.

All swing ploughs.

117. In construction and in form, excepting Nos. 9 and 29, they present no very marked peculiarities; all of the ploughs are swing ploughs, and as such are open to the objection, common to such implements, of being difficult to manage. This defect can be however easily remedied, and, in the trials the ploughs were subjected to, a wheel was fitted on all.

Cheap implements.

118. The cost-price of these ploughs delivered at Madras averaged about Rs. 33, which, considering the substantial manner in which they are put together, is very moderate.

119. All the ploughs are made either of wrought iron, cast iron, or steel in their different parts. The stilts and beams are in all cases made of wrought iron; Nos. 1, 2, 12, 16, 37 and 38, have trussed, the others simple beams. Excepting in the case of Nos. 29 and 34 the bodies are made of cast iron, whilst in the two ploughs referred to wrought iron is used. The slades are in every case cast, whilst the shares are all wrought iron. Steel mould-boards are fitted to Nos. 27, 29, 30, 34, 37, 38, 39, and 40, and those of the rest are cast iron.

120. In No. 9 a plan, which is totally inapplicable to the construction of machines for this country, and of doubtful economy anywhere, is adopted; the body, slade, and mould-board, are cast in one piece, thus increasing the risk of breakage, and the cost of repair if an accident occurred; to this method of construction, the general objections to castings, urged in the report for the year 1874-75, paragraph 135, are particularly applicable.

121. No. 29 is a very small plough; exceedingly light and short, tolerably efficient, but its peculiarity lies in or tilt being dispensed with, the solitary one, however, is fitted at the top with a c pipe on which two handles are fixed.

122. In the following table the r s of a trial of the ploughs, has swing ploughs, are given:—

Plough.	Furrow. Average. Depth.	Furrow. Average. Width.	Cubic Yards of Soil moved in 144 yards run.	Draught.	Comparative Efficiency.	Weight without Wheel.
	INCHES.	INCHES.	C. YARDS.	LBS.		LBS.
	4		4·4	175	100	88
	4·5		7·875	259	92·18	147
	4·25		6·6	385	90·91	79
	4·00		7·31	343	81·52	126
			6·125		74·78	156
			6·14	420	70·31	126
					70·14	126
					68·75	133
					68·65	71
					68·59	126
					67·05	150
					67·00	167
					56·79	223
					53·81	185
					49·27	173
						142

123. The Ransome's plough referred to in the table was not a swing plough so that the comparison is not complete, but still the excessive draught for work done is very clear, and when this is considered in addition to the difficulties of managing a swing plough, it is evident that as such the Swedish ploughs on the whole are not to be compared with the wheel ploughs of the English make.

124. To see whether if fitted with a wheel these ploughs would be found to have any comparative merits, the trials, of which the following are the results, were made:—

Plough.	Furrow. Average. Depth.	Furrow. Average. Width.	Cubic Yards of Soil moved in 144 yards run.	Draught.	Comparative Efficiency.	Weight with Wheel.
	INCHES.	INCHES.	C. YARDS.	LBS.		LBS.
Ransome's	3·75	9	3·75	175	100	88
No. 39	4·5	11·375	5·9375	273	101·49	137
„ 29	4·5	11·5	5·75	273	98·29	82
„ 40	4·5625	11·125	5·64	273	96·41	137
„ 27	3·8125	10·75	4·55	224	94·79	137
„ 3	4·625	9·25	4·69	231	94·74	144
„ 12	4·4375	11·325	5·757	294	91·38	234
„ 34	4·0000	10·125	4·5	231	90·91	90
„ 37	4·125	12·5	5·729	329	81·26	167
„ 2	4·0000	10·75	4·7	294	75·84	178
„ 1	4·3125	11·125	5·33	336	74·03	184
„ 9	4·4375	7·875	3·88	245	73·80	137
„ 30	4·0625	10·5	4·85	329	68·79	158
„ 38	4·0625	10·5	4·525	315	67·00	161
„ 16	4·5	10·5	5·25	378	64·82	196
Average of 14 Swedish Ploughs	..	..	5·0833	287·5	82·515	153

Although, because the two sets of trials were performed at different dates and in different fields, and that during the period which elapsed between them the land had become considerably drier, the outturn of work for draught on the two occasions cannot be fairly compared, yet, seeing that the same Ransome's plough was tested in both cases, it is fair to conclude that a proportionate increase of draught for work done would take place in all the ploughs, owing to the different conditions under which the two trials are conducted. The Ransome's plough whilst registering the same draught in both cases, on the second occasion moved 15·60 per cent. less soil in a given distance.

125. Bearing the above-mentioned fact in mind, the decrease in draught, shown in the trials after a wheel had been added, must be attributed solely to that addition; the average decrease of draught in the ploughs is 68·3 lbs., or 19·2 per cent., and from this the usefulness of a wheel may be easily judged

A wheel effects the draught to a great degree.

126. The effect, however, that the wheel had in lessening the draught varied very much in every case, and there were two remarkable exceptions to the rule, viz., Nos. 30 and 34; the former displayed less than and the latter the same efficiency as compared with Ransome's plough when used as swing ploughs, showing clearly that these two implements can be used comparatively advantageously as such. The effect of the wheel in Nos. 9, 16, 37, 38 was very small, but still sufficient to recommend the addition.

127. These trials have shown very clearly that, for such work as they were doing at the time of trial, the lighter ploughs were far more effective, both when fitted with wheels and when used as swing ploughs; this may be partially accounted for by the fact that, draught equal to about three-fourths of the gross weight of a plough is consumed in moving it when is doing no work, and also because the heavier, that is larger, ploughs are better adapted to deeper work, or for ploughing stiffer soils than those on which they were tested. The following table shows the points referred to:—

For land similar to that of trials heavy ploughs not suited.

—	Without a Wheel.		With a Wheel.	
	Seven lightest.	Seven heaviest.	Seven lightest.	Seven heaviest.
Average gross weight	112 lbs.	172 lbs.	123 lbs.	183 lbs.
Average soil moved in 144 yards run	5·15 c. yds.	6·05 c. yds.	4·99 c. yds.	6·17 c. yds.
Average draught	330 lbs.	382 lbs.	250 lbs.	325 lbs.
Comparative efficiency	100	85	100	80
Comparative efficiency deducting from draught ¼ of gross weight.	100	95	100	86

128. Another point has been shown by this experiment, that is, that the friction on a steel or cast-iron mould-board does not differ sufficiently to form an item in the draught; the extra weight, however, of the cast-iron mould-board is objectionable, and the following table demonstrated the fact referred to very clearly:—

—	Without a Wheel.		Without a Wheel.	
	Eight Ploughs.	Six Ploughs.	Eight Ploughs.	Six Ploughs.
	Mould-board, steel.	Mould-board, cast-iron.	Mould-board, steel.	Mould-board, cast-iron.
Average gross weight	123 lbs.	168 lbs.	134 lbs.	179 lbs.
Average draught	330 lbs.	360 lbs.	281 lbs.	296 lbs.
Average soil moved	6·25 c. yds.	6·56 c. yds.	5·925 c. yds.	4·947 c. yds.
Comparative efficiency	100	96·24	100	79·26
Comparative efficiency deducting from draught ¼ of gross weight.	100	106·74	100	93·24

129. *Water-lifts.*—No new machines have been experimented with during the year. The double mhote, so often referred to in these reports, continues to give most satisfactory results. The chain-pump, referred to in paragraph 184 of the last report, has also worked with fair results, but the expense of repairs on it is very great.

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SECTION V.

DISTRIBUTION OF SEEDS.

130. During the past year the following seeds have been distributed to the districts mentioned in the following table:—

—	Maize.	Sorghum Saccharatum.	Planter's Friend.	Yellow Cholum.	Carolina Paddy.	N O Cotton.	Egyptian Cotton-seed.	Tobacco-seed.	Jute-seed.	Wheat.	Cowpilly-seed.	Sundries.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	oz.	lbs.	lbs.	lbs.	
Ganjam	50	50	50	..	..	..	..	..	10	..	..	..
Vizagapatam	5	15	55	..	..	..	..	7 oz.	..	..	..	..
Godavery	30	30	20	..	..	..	..	..	..	..	..	..
Kistna	20	20	20	..	..	25	..	..	..	..	..	..
Nellore	..	100	23	..	..	..	..	..	..	..	..	..
Cuddapah	50	..	..	..	..	..	..	..	..	..	..	..
Kurnool	20	..	..	..	..	..	..	..	..	..	..	..
Bellary	10	100	100	..	..	..	..	1 oz.	..	..	..	..
North Arcot	20	20	20	..	..	50	10	..	..	10	..	..
Madras	..	90	45	..	235	10	..	..	..	..	..	..
Chingleput	87	15	5	..	..	100	..	..	..	..	..	..
South Arcot	50	25	..	..	..	..	..	6 oz.	..	..	..	..
Salem	80	72	30	..	..	..	..	4 oz.	..	..	5	..
Coimbatore	5	..	..	..	..	..	..	11 oz.	..	..	..	..
Trichinopoly	65	5	5	5	..	..	..	..	..	..	..	..
Madura	5	25	10	..	..	..	..	..	..	..	..	..
Tanjore	5	½	½	..	95	20	..	..	..	..	..	..
Tinnevelly	15	80½	70	..	..	..	½	½	..	..	..	27 packets.
Malabar	100	65	80	..	..	..	..	..	..	..	..	2 do.
South Canara	53	10	5	10	..	..	..	..	..	..	..	..
Nilgiris	..	100	50	..	..	..	..	..	..	..	..	..
Mysore	..	10	10	..	5	10	..	..	..	..	..	9 packets.
Travancore	..	30	35	..	..	10	..	..	..	..	..	..
Bombay	16	20	..	..	..	..	..	..	..	..	..	..
Rajputana	10	10	..	..	..	..	..	..	..	..	..	..
	4	..	..	..	..	..	..	1 lb. 13 oz.	10	10	5	38 packets.
Total ..	700	862½	633½	15	335	320½	10½					

131. The tobacco-seed referred to was imported, under the orders of the Board of Revenue, from Australia; but very few applications, as will be seen, were made for it.

SECTION VI.

IMPLEMENT WORKSHOPS.

132. During the past year, besides the implements mentioned in the accompanying table being manufactured for sale, a large amount of repairs of tools, &c., for the farm, the furniture for the School of Agriculture, and various models of water-lifts, &c., for distribution were made:—

Districts to which sent.	Iron Ploughs.	American Ploughs.	Combined Ploughs.	Jointed Harrow.	Drill Sowing Machine.	Planters' Hoes.	Reaping Knives.	Winnowing Machine.	Chaff Cutter.
Coimbatore	..	1	..	..	..	..	..	..	..
Mysore	8	3	..	..	..	..	12	1	1
Tinnevelly	1	1	..	1	1	12	..	..	..
Coorg	..	1	..	..	..	..	..	..	1
Bellary	..	..	..	..	..	..	..	..	1
Nilgiris	..	..	..	..	..	..	..	..	..
Madras	..	2	..	..	..	..	..	..	..
Total ..	9	8	4	1	1	12	12	1	3

133. A plough very similar to th American one, referred to in paragraph 138 of the report for the year 1874-75, ha been made in the shops, costing about Rupees 20; several modifications, of the mo imported from America, materially affecting the efficiency of the plough, were n lo. It is the American plough referred to in the table given in the preceding pa graph.

134. The following is a statem t of the transactions of the shops during the year :—

Expenditure.	Rs. A.
Plant	2 11
Labor, &c. ..	1,066 10
Materials, &c. ..	877 2
Total ..	1,946 8

Income.	Rs. A. P.
Machines	915 13 0
Materials, labor, &c.	1,423 14 2
Total ..	2,339 11 2

135. The next statement shows t financial condition of the shops. It will be seen that the deficiency, since their co nencement in 1871, has been slightly reduced during the year; the reduction wo have been greater had the plan formerly pursued, of calculating the valuation the plant, been adopted, instead of taking the actual valuation.

Balance Sheet of Imple t Workshops on 31st March 1877.

Liabilities.	Rs. A. P.	Rs. A. P.
Capital—		
Advanced 1870-71	583 1 5	
Do. 1871-72	213 14 2	
Do. 1872-73	1,077 3 2	
Do. 1875-76	219 4 11	
	2,302 10 8	
Repaid— Rs. A. P.		
1873-74 .. 213 10 5		
1874-75 .. 122 15 9		
1876-77 .. 393 7 2		
	729 13 4	
Outstanding bills	..	1,6
		1
Total ..	..	1,8

Assets.	Rs. A. P.	Rs. A. P.
Valuation—		
Buildings	419 15 3	
Plant	243 5 0	
Materials	51 6 0	
Implements for sale ..	283 0 9	
		997 10 3
Outstanding bills	..	306 2 3
Deficiency	..	514 15 2
Total ..	..	1,818 11 8

SEC ION VII.

STATE.

136. The area of the farm estate mains unchanged, for, although the new site for the Comm ariat Slaughter-houses was given over, when funds were fou to be unavailable for carrying out their much-to-be-desired removal, it was retransi red.

Area.

137. The removal of the wudder llage has lessened the trespass we suffer from, but until the sla ghter-houses are removed, and Roshunbaughum village is fence or walled in in a manner that will prevent it, the nuisance must continue to be very great.

Trespass nuisance.

138. The many difficulties in the ay of carrying out experiments in a satisfactory manner are ra dly disappearing, now that the requisite estate improvements e nearly completed; and as soon as the whole land within th boundaries of the farm is given over to it,

Satisfactory experiments will be possible in the future.

and trespass can be prevented, they will be removed. Now that so much of the land has been levelled to a moderate slope, the detrimental influences of an excess of water, either running or stagnant, will b removed; the effects of manuring will be more permanent and marked, and the de ired evenness of quality of soil will, it is hoped, be obtained.

PERMANENT IMI ROVEMENTS.

The estate improvements carried out d ;g the year, under the superintendence of Mr. Schiffmayer, comprise, amongst others, the re-arrangement and extension of the farm buildings, including a duck-house for the reception and acclimatization of exotic breeds, a new sheep-shed, an extension of the barn to form a cake-room, a d several minor works; a large area of land being levelled and arranged in such a manner as to admit of the existing wells and c annels being utilized; the extension and deepening of the irriga ion channel, referred to in paragraph 26 of the report for the y ear 1872-73; the excavation of a new channel on the western side of the farm to bring the water from the Adyar to the central portions of it where it will be rai ed for irrigation purposes; laying out and partially completing a new main drive running through the farm from east to west, and building a lodge at the western entrance gate; laying out a portion of the experimental botanical grounds for the Agricultural College; l anting several acres of the poorer soils with casuarina and o her trees; and working the tile-yard, where a number of b icks for the new buildings, drain-pipes, and other articles were manufactured.

Buildings.

Levellings.

Irrigation Channel.

Road.

Planting.

Tile-yard.

(Signed) CHARLES BENSON, M.R.A.C.,
Superintendent of Sydapet Farm.

SYDAPET,
August 27th, 1877.

WILLIAM R. ROBERTSON, M.R.A.C.,
Superintendent of Government Farms.

THE AGRICULTURAL COLLEGE.

In my last Annual Report, I not[ed] briefly, this new institution. It seems desirable that a fuller account of the ci[r]cumstances that have led to its establishment should be placed on record.

2. Almost from the time the Sydap[et] Experimental Farm was first opened, it had attached to it a [n]umber of Apprenticeships, which were filled by Eurasian and [H]indu youths. Up to 1871 there was only one class of these Apprentices. These you[ths] were afforded only such training as could be had from taking part in the ordinary operations of the farm. Each Apprentice began on a monthly salary of Rupees 15, which was increased annually, on good conduct, until Rupees 25 per mensem was reached. All were provided with free quarters. In 1871, it having been determined to start a number of District Farms, another class of Apprentices was established, in view to provide Superintendents for these new farms. To these Apprenticeships liberal salaries (Rupees [50] each per mensem) were attached, in order to induce young men of good social position to offer themselves for training. The class was filled, but not with men of the stamp it was hoped to obtain; indeed, all the inducements offered failed in securing anything like a competition for the apprenticeships and only two or three were filled by men of a fairly good social position, while none of those appointed were educated men. The class was filled by Hindus and Mahomedans. The training to which these youths were to be subjected was similar to that of the youths in the other class.

Sydapet Farm Apprentices.

District Farm Apprentice Class.

3. References were frequently ma[de] in my Annual Reports, to the very unfavorable conditions under which these youths were placed for gaining a knowledge of agriculture. The progress made by one or two of the youths was certainly fair, bearing in mind the difficulties they had to contend with, but the general results were unsatisfactory; the means employed were clearly quite inadequate for training men to fill the posts of District Farm Superintendents. On this subject I addressed the Board of Revenue as follows in a letter, No. 414, of the 28th of May 1872, I addressed the Board of Revenue as fo[llo]ws:—

Unsatisfactory conditions under which placed.

"The arrangements for training and e[du]cating Farm Apprentices need much fuller consideration. If we are to turn out really competent Superintendents, men who will be able to train youths on the local farms, and who will be worth to Government from 150 to 250 Rupees per mensem, it is evident that we must go about our work in a *very thorough and systematic* manner, or the three years allotted for training, &c., will not nearly suffice. It is of the utmost importance that *we should now* come to a clear and definite understanding, as to the course to be pursued in training these apprentices. Fortunately, agricultural training is no new experiment; we have before us the results of many years' experience, in the training of agricultural pupils in America, on the Continent of Europe and in Great Britain and Ireland. It is true that the social habits of the people of this country are altogether different to the habits of the people in any of the countries I have named, while their agricultural practice is equally peculiar, rendering it necessary that our work, to a certain extent, should be experimental; still there is much in the experiences of other countries that may serve, to warn us as to the dangers to be avoided, and indicate the general direction towards which our endeavours should tend. The system under which agricultural pupils are trained in Ireland is, I believe, the most suitable for such a country as this, peopled with poor cultivators holding very small areas of land. This system undoubtedly has its faults, but these are unimportant in comparison with the vast benefits it confers. Under the Irish system, agricultural schools, of different grades, with small farms attached, are equally distributed over the country; in the schools the pupils receive a good literary and agricultural education. These schools are the feeders of the central institution, to which the best pupils, after qualifying, are sent to complete their agricultural training, at the entire expense of Government. These pupils become the Superintendents of the local farms and agricultural schools, farmers, stewards and bailiffs, and thus sound agricultural knowledge is gradually extended over the country.

"In the Madras Presidency this system would work admirably. A central farm, with branch local farms, already forms part of our scheme. The apprenticeships of 40 Rupees each per mensem, to be created for each projected farm, might be turned into scholarships, to be awarded to the most competent pupils, after a sufficient time had elapsed to admit of their progress being determined, all students thus entering at a uniform allowance of 15 Rupees a month under the terms of G.O., No. 1,041, dated 13th June 1871. The students to be either Natives or East Indians, and all to undergo an entrance examination, to be similar to that for admission into the Engineering College, or the subordinate ranks of the Medical Department. The course of training to extend over three years, during which time the pupil should receive a thorough practical training in the field, and a theoretical training in the lecture-room; lectures on agriculture, agricultural chemistry, botany, mechanics, veterinary surgery, &c., being delivered at stated periods; while periodical examinations should be held, in order that the progress of the pupils may be ascertained."

These proposals did not meet with the approval of the Board, or Government.

4. In my report for the year ending 31st of March 1873, I wrote as follows regarding these apprentices:—

"The general conduct of these young men while at the farm has been satisfactory, and they evince some interest in their duties, especially in those of a practical kind; all are able to work our English ploughs; indeed, two or three can plough very well. But the system is certainly not one that is calculated to train Superintendents to be placed in charge of the district farms. These young men come here ignorant of the very ABC of agriculture, and agriculture can be taught only in the way that any other profession is taught, that is, by beginning with systematic elementary instruction, and grounding the student thoroughly as he proceeds in his education. The system under which these young men are supposed to be taught agriculture is, it is true, that under which many agricultural pupils are placed in England; but little consideration is needed to enable one to see that such a system, even if beneficial in England, can be so, only under conditions *which are not met with in this country*. In England, young men who are placed for a time with a farmer to learn practical farming, frequently spend a year or more at some institution devoted to the teaching of agriculture or the sciences bearing on agriculture; and the superior practice which they are taught is no novelty. Some of these young men may in time, under the training under which they are now placed, become suited for employment as Overseers under certain conditions, and they might also under certain conditions make successful farmers, but they can never become what the District Farm Superintendents should be—local sources of agricultural information, local authorities on all relating to the agricultural practice of their districts, and the pioneers of agricultural reform."

5. In June of the same year in which the foregoing remarks were penned, the Board of Revenue were led to make more minute inquiries, as to the working of the system under which the apprentices were placed for training. The results of those inquiries are embodied in a letter, they addressed to Government, from which the following extracts are taken:—

"In their Order of the 7th April 1873, No. 397 Government agreed with the Board that the establishment of a system of agricultural education at the Sydapet Farm should be deferred as premature, but ordered that the arrangements already sanctioned should be made complete and effectual, *i.e.*, that the Sydapet Farm should be made as useful to the public as possible, and that District Experimental Farms should be instituted and provided with competent superintendents.

"In devising means for carrying out these orders, the Board have been led to make minute inquiries as to the methods pursued at the Government Farm, as to the facilities for training Farm Superintendents there, and as to the manner in which the information possessed by Mr. Robertson and his subordinates can best be disseminated. One result is that the Board's opinion, that the commencement of systematic instruction in agriculture and the sciences bearing

students are allowed to attend, the opportunities of selecting competent men for the service of the State will be greatly increased.

"For some time to come, for obvious reasons, the supervision should be left to the Board and not entrusted to the Educational Department. This is in accordance with the practice of several of the States of Germany where the Agricultural Colleges are under the Minister of Agriculture, and of America where the Board believe that agricultural education is supervised by the Commissioner of Agriculture.

6. In order that the matter might be laid fully before Government, I was directed to submit my views to the Board on the whole question of agricultural education. This I did, in a letter, dated the 14th of October 1873; from this letter the extracts that follow are taken:—

"The time seems now to have arrived for a commencement to be made in this Presidency in systematic agricultural education. Our literary institutions are turning out annually large numbers of fairly-educated young men, many of whom have a very uncertain future before them, and amongst these we might expect to find no inconsiderable number who naturally belong to agriculture, and who would readily undergo a systematic agricultural training. In this way an Agricultural College *would aid in restoring the balance* which the undue facilities for obtaining a mere literary education, have so greatly disturbed. At present our schools and colleges *are drawing from agriculture the best of her men*; if this is allowed to continue, our degraded husbandry will only become the more degraded. We have established a Medical and an Engineering College, neither of which can possibly confer on the country a tithe of the benefits that would result from the existence of a well-organised, well-supported Agricultural College.

"We have wasted much time, and large sums of money, in the hap-hazard, unsystematic way in which we have endeavoured to bring about some improvement in the husbandry of the people. We cannot longer continue to deal with our agriculture in the way we have dealt with it heretofore; surely the enormous mass of evidence now available amongst the records of the Government of this Presidency, regarding the results which have attended the spasmodic and very unsystematic efforts to effect some improvement in native farming, is sufficiently convincing, and this evidence is conclusive, as to the unsatisfactory character of the results. And, such being the case, it is abundantly evident that we must either retire altogether from all active exertions, on behalf of the improvement of our husbandry, or we must apply our efforts in some other direction and in a way somewhat different.

"It is admitted in all civilised countries that, while the ownership of land confers rights and privileges, it also creates duties, and not the least of these is a responsible stewardship on behalf of the people, their interests being effected for good or for evil through a fall or a rise in the prices of the necessities of life, as the duties arising out of this trust are well or are ill-performed. Now, in this Presidency the duties created by the ownership of land naturally devolve on Government, as in most districts Government is the chief land-owner; though undoubtedly these duties and responsibilities should be shared in by the other owners of land, whose position will most certainly be bettered by any well organised, well-directed effort to promote our agriculture. But, if this view of our responsibility is not deemed to be sufficiently weighty to justify Government in at once inaugurating a complete and efficient system of agricultural instruction, surely, *self-interest* will be a sufficient reason. It is not too much to say that, if sound agricultural knowledge was diffused over the country, *famines would be less frequent and less severe in their character*; that there would be less need for the frequent large annual remissions of rent; that the vast capital sunk in railways, canals, irrigation works, &c., would bring in more remunerative returns, while we would not have large areas of land abandoned as has recently been witnessed in different parts of India, because the irrigation means provided by the Engineer are *too complete* for an easy-going agriculture.

"I have no desire to advocate the merits of the educational scheme at the expense of the merits of the farm scheme; there is nothing of an opposing character in the two schemes. It seems to me that, in the true order of development, the farm scheme would naturally arise out of the educational scheme. I am very strongly of the opinion that, in the present state of our rural affairs, an institution, such as the Board desire to see established, will produce results of far greater importance than those that could possibly arise from the working of District Farms, with such inefficient means as we can now only command, while, in the first outlay and in the annual working charges, such an institution would be much less costly, than the farms it was proposed to commence at once, in four districts of this Presidency. Even, if we could command the means to admit of these farms being worked in a really efficient way, I do not think that they would be of great use as mere example farms, in the present state of education amongst our rural population. The fact is, example farms belong to a higher stage in agricultural improvement than has yet been reached in this country. Example farming will undoubtedly now do some good,

upon it could be and should be deferred, h
to solicit Government to reconsider the ques

"The reasons which have influenced tha

"(1.) That unless systematic instruc
given at the Sydapet Farm
Farms which are to be institu

"(2.) That, without Superintendents
be of little or no use.

"(3.) That the means for giving
tunities for practising what i

"(4.) That the good effects of the in
of Government Farms, but wi
as in England, America, Fra

"(5.) That as a scene of systematic
will be infinitely more useful

"It is easy to show that the presen
and sow and manure, &c., will not supply
classes of Apprentices in the Sydapet Farm.
dated 13th June 1871, No. 1,041. They a
they are fairly educated, and they are paid s
years to Rupees 25. The class is meant to
but nothing more. The other class consists
under G.O., dated 22nd September 1871,
the number from six to ten. They are paid
sufficient to attract the right sort of men.
to the other class and supply Farm Superin
one of them who seems at all likely to beco

"The present system must be admitte
it *must* be unsuccessful; for no one, who is
of chemistry, botany, animal pathology, &c
of the farm, will be able to vary its process
soil, different crops, different breeds of cattl
a skilful farmer in Madras would find hi
suddenly placed in Bellary. The scientific
of the farm are the same everywhere, but t

"But even, if by extraordinary abilit
nothing of scientific principles were to su
give a sensible reason *why* when he worked

"It is found necessary to conduct yo
Overseers or Doctors and Hospital Assistar
must be done with men who are to exem
must go through courses of lectures in
chemistry, in animal pathology, and vet
the lessons thus taught them on the soil it
education to begin with.

"The Board have been in communic
are confident that lecturers, who will del
animal pathology, and veterinary me
possession of a fair education can be teste
instruction in book-keeping, surveying, me

"The expenditure on instruction thu
without interfering with the establishment

"The stipend of Rupees 40 granted
two classes should be on the same footing,
and Rupees 5 being allowed as batta to
may then be increased, the increments of
prizes established without additional cost.

rience "The machinery thus provided will
the ga Farm Superintendents, but for trainii

completely changed. I am accordingly directed
n.

oard may be briefly summarised as follows:—

a in agriculture and the sciences bearing on it is
competent Superintendents for the Experimental
d cannot be trained there.

ained in this way, the Experimental Farms will

h a training, the lectures, the students, the oppor-
ught, and the funds are all available.

uction will not be limited to a few Superintendents
lowly leaven the agriculture of the whole country,
, and Germany.

raction open to all comers, the Sydapet Farm
the public than it is at present.

ystem of teaching Apprentices how to plough
mpetent Farm Superintendents. There are two
ne class, six in number, was formed under G.O.,
ppointed after an examination which shows that
ies beginning at Rupees 15, and increasing in four
ply Overseers and subordinates, and will do this,
the six District Apprentices chosen by Collectors
. 1,657, and Government now propose to raise
pees 40, but even this high salary has not been
intended that they should be superior in station
dents; but the Board are assured that there is not
it for such an employment.

erefore, to be unsuccessful in practice. In theory
out an agricultural education and some knowledge
owever skilled he may be in the manipulations
as to adapt them to a different climate, a different
l different agricultural conditions. A man who is
f at a loss even in ordinary farming if he were
neiples which underlie and suggest the processes
ocesses themselves change.

Superintendent of a Government Farm knowing
in cultivating the farm, he would be unable to
different way from his neighbors.

who intend to be Engineers and Public Works
hrough a stated curriculum, and the same thing
and teach scientific agriculture. The students
ulture, in elementary chemistry, in agricultural
ry medicine, and in botany; they must verify
and on cattle, and they must have a fair general

with the Principal of the Medical College, and
lectures once a week on elementary chemistry,
e, and botany, can be obtained thence. The
an entrance examination and supplemented by
ation, &c., without difficulty.

curred can be paid from the Surplus Pound Fund
the experimental farms.

e District Apprentices is needlessly large, and the
r salaries increasing from Rupees 15 to Rupees 25,
entices who come from a distance. The number
y regulated by examination, and scholarships and

e not only for turning Apprentices into Overseers
large number of private students, and if private

students are allowed to attend, the opportunities of selecting competent men for the service of the State will be greatly increased.

"For some time to come, for obvious reasons, the supervision should be left to the Board and not entrusted to the Educational Department. This is in accordance with the practice of several of the States of Germany where the Agricultural Colleges are under the Minister of Agriculture, and of America where the Board believe that agricultural education is supervised by the Commissioner of Agriculture.

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but the benefits that will result therefrom
time, labor, and money, in comparison with
few years hence, after direct agricultural tra

"A District Model or Example Farm
experience. On such a farm we say that th
particular soil of this district, that this or
yield the best results on the soils of this dis
largest returns when cultivated in this or th
of cattle is the most suited to the district.
at present. We have, in most districts, *yet*
an Example Farm to diffuse. Such farms i
principles of agriculture, and in which the
Experimental Farms, whose duty it will be
practice, on the Example or Model Farm, is

"But, before Experimental Farms or S
the services of well educated, trained men,
to the details of mere routine work of ordina
ledge is, but men who are capable of making
who have a sufficient acquaintance with th
tions on what they do observe, and form
ments they may conduct. The informatio
carefully observed and intelligently interpr
sponding degree will be the injury, if our cu
from the supposed teachings of an expe
conducted; indeed, it would be better to
practice, rather than that they should be ind
faith of the accuracy of deductions found
country much injury has already been done,
of effecting improvements in our agriculture

"If, then, I am correct in thinking th
competent agriculturists before we can star
itself is, can such men be procured in this
I experience no difficulty whatever in at one
are not now procurable in this country, no
without Indian experience) at a cost far abo
this Presidency a large number of young
many of whom possess a slight acquaintan
something is due in our having disturbed the
lived. Many have been drawn from agricu
agricultural career, could they but see a w
those prospects and hopes that have sprun
thus an abundance of raw material, ready
agricultural instruction, we might hope to o

"I attach great importance to the fact
not merely to supply superintendents and
an agricultural education to *all* approved st
had the scheme been narrowed down to pro
posed farms, though, of course, for some tim
qualifying, as speedily as possible, a numbe
of Government.

"In organising the institution, we n
contains something like thirty-one million
engaged directly or indirectly in agricultu
occupy the same low level in the scale of c
resident land-owners, with education and
their husbandry, they can but look to Go
think, be any doubt but that Government
in the land revenue considerably in excess
indirect results in stimulating and devel
much of the anxiety which, during seaso
welfare of cultivators on private estates, as
with them, while the expenditure usua
tionately reduced.

be obtained at a very considerable expenditure of
at would be effected by such farms, established a
ng had, for some time, been in operation.

the exemplification of the sum total of all local
practice is the practice that is best suited to the
it kind of manure applied in this or that way will
t; that in this district this or that crop yields the
way, and that this variety of sheep or that variety
v it is evident that such farms cannot be started
certain the facts, which it is the special duty of
his country, where so little is known of the first
ractice is purely empirical, must be preceded by
collect and verify the information upon which the
be based.

ions can be started, we must be able to command
men whose agricultural knowledge is confined
or improved farming, important as such know-
servations, men who can think for themselves and
atural sciences, to be able to form accurate deduc-
liable conclusions on the results of the experi-
yielded by an agricultural experiment, when
d, may be of the utmost value; so, in a corre-
vators should be induced to change their practice
ent which had been improperly or ignorantly
w our ryots to pursue their present imperfect
d to adopt other and unfamiliar methods on the
on improperly-conducted experiments. In this
d serious difficulties have been thrown in the way
rom causes such as these.

we must secure the services of well-trained, really
ur district farms, the next question that presents
untry, or elsewhere, on reasonable terms? This
nswering in the negative. Such men as we need
are they obtainable anywhere, except (and then
what we would be justified in incurring. But in
are annually leaving our Schools and Colleges,
with Indian rural affairs. To these young men
sy-going arrangements under which their fathers
re, and some would double gladly return to an
in which this could be don, without sacrificing
up with their progressing education. There is
at hand, out of which, under a good system of
in the men needed for our proposed farms.

at the proposed institution is to be established,
er officers for our district farms, but also to afford
lents. It would have been extremely unfortunate
le only the agency needed for carrying on the pro-
the main efforts of the College must be directed to
of young men to meet the *immediate* requirements

not lose sight of the fact that our Presidency
persons, and that of these fully two-thirds are
employments; that nearly the whole of these people
ization; and that, in the absence amongst them of
icient enterprise to lead in any attempt to improve
rnment for advice and guidance. There cannot, I
tion in this direction will result in a direct increase
the amount which this action may cost, while the
ng private enterprise will relieve Government of
of scarcity, they must experience concerning the
ll as of those cultivators more immediately connected
incurred during such emergencies will be propor-

"To give full effect to the Board's proposals, a
thing of the status that has been given to medical a
by the erection of Colleges supported by Governr
necessary that an Agricultural College should b
to be absolutely required wherever any attempt h
to provide agricultural instruction. It is no more
education in agriculture without lecture-rooms,
library, &c., than it is, without these aids, to afford
not ask for elaborate and costly structures, but at pr
the accommodation needed.

"But not only do we need a building in which we may find the accommodation we require, but that building should be situated in the midst of the scene of our practical instruction. This is *very important*. It will be difficult with Hindu students to combine our practical and theoretical teaching under any circumstances; but these difficulties would be greatly increased if the building in which the theoretical teaching is conducted is situated away from the farms.

"The general arrangements of the College, as regards management and admission, should, I think, be something similar to those of the Medical and Engineering Colleges.

"The instruction to be given in the institution will, for a time, be rather that of the school than that of the College. We must, at any rate for two or three years, conduct a preparatory class to enable our students to benefit by the lectures that they will afterwards attend when they get into the College classes. But, as soon as there are men who have passed satisfactorily through the whole course available for elementary work in the districts, the preparatory class at the College should be abolished, when the energies of the teaching staff might be devoted to work of a more legitimate kind. To bring about this desired result, in a more speedy way, it might be well to invite young men who are studying for school-teachers to attend a short course of instruction to qualify them to conduct a small preparatory class in the schools with which they may afterwards be connected, the inducement to be offered being a small fee for each student they succeed in qualifying for admission into the College.

"The course of instruction at the College should, I think, at present extend over a period of three years, one year in the preparatory class and two years in the College classes only, when the district elementary classes afterwards reduced to two years in the College classes only, when the district elementary classes have been established.

"To afford a practical as well as a theoretical education, arrangements should be made to admit of each student becoming thoroughly acquainted with agricultural operations on the farm itself. Each student should, during a considerable proportion of his pupilage, be engaged in the actual work of the farm, not that his labor will be of any use to the farm, but because he can become a farmer in no other way. Such employment should be purely for educational purposes, and as such can be of use only to the student himself. It may pay the farm to employ young men constantly at the work with which they are best acquainted, but from such employments they would learn but little. For educational purposes they must be engaged in occupations of which they know little, and such employments, however beneficial from an educational point of view, are never remunerative in rupees. But, not only must our students engage in farm-work as a part of their direct training, but because a taste for agricultural pursuits can be fostered only in this way. Agricultural students who have pursued a College course without undergoing any practical training seldom engage in actual farming, as they are removed from all sympathy with farmers at the time of life when tastes and habits are formed; while an occasional employment in the lighter work of the farm will conduce greatly to healthy bodies and sound minds; it is necessary that we should develop the physical as well as the mental powers of our students. In framing the curriculum of study there will, I think, be no difficulty in providing facilities to enable each student to make himself thoroughly acquainted with practical farming.

"In the preparatory class the instruction to be given should be such as will enable the young men to qualify themselves for admission into the College classes. When in the class-room this class should, I think, be under the charge of a literary teacher, who could give instruction in Farm Book-keeping and also instruction in Mensuration sufficient to enable the members of the class to measure and value any kind of agricultural task-work, to ascertain the cubical contents of a heap of manure, a stack of hay or of corn, the weight of cattle, &c., and with the chain to measure small areas of land, &c. He should give instruction in the use of maps and plans, and should make his pupils acquainted with the ordinary meteorological instruments, their uses, &c. This class should read together the different elementary text-books on the subjects of the lectures, which they will afterwards attend; and during the reading of these books, the teacher should avail himself of every opprtunity to make the young men understand the meaning of the different scientific and technical words with which they may meet. Monthly

examinations should be held, in order that th
ascertained.

"The lectures to be delivered during th
Agriculture, Agricultural Chemistry, Veget
Physiology, and the pathology and treatm
Practical Geology, &c. In addition to le
subjects of the lectures, occasional field cl
Europeans, East Indians, and Natives shou
No fee of any sort should be charged u
but every student should be compelled to p
class.

"It appears to me that there should b
undergo instruction in the institution—a
Government; another (2) for private stu
nobility and wealthy land-owners of the Pr
for attendance at lectures only. * * *
needed to provide the means necessary, to
a very insignificant amount when contraste
from the education to be given. In the
whole of the students are boarded and edu
is done in nearly all the countries of
United States every State Agricultural Co
youths—sometimes as many as one hundre
is necessary in these countries, surely we ne

7. The Board in submitting to
however dissenting) to have changed
now advocated the postponement of t
regarding the state of agriculture in t

8. The system under which t
continued, therefore, unchanged. In
March 1874 I again wrote regarding

"Though, making due allowance for
apprentices have done fairly satisfactory, t
themselves to hold District Farm Superinte
account; it was decidedly a mistake to supp
of agriculture or of kindred subjects, would
on the Sydapet Farm, become qualified to
a training as I have often pointed out, sh
situated in localities similarly circumstance
employment as Overseers under efficient su
to do more than this. Under a good syste
room and the field, there would be no di
thoroughly in agriculture."

9. In G.O., dated the 19th of M
proposals for engaging in agricultur
though the scheme I had submitte
nevertheless, desirable to make use
agricultural education, and they acco
with me, to submit a detailed schem
could be afforded.

10. In the Proceedings of the B
was directed to draw up and submit t
I accordingly drew up a scheme and su
after undergoing some slight modificati

11. The following extracts are fr

progress made by the members of this class may be

College course of two years should, I think, be on
le Physiology, and Agricultural Botany, Animal
t of the diseases of the animals of the farm,
ures there should be conversation classes on the
es, and a select laboratory class. * * * * *
alike be eligible for admission into the institution.
the institution has been some time in existence,
ide for himself the text-books, &c., required in his

ree divisions in which to class those who wish to
sion (1) for those whose stipends will be paid by
ts and students who will be supported by the
ency; and a third (3) for those persons who enter
* The comparatively small sum, that will be
effect to the foregoing proposals, will represent but
ith the importance of the results that may spring
h Agricultural Institution in Dublin *nearly the*
d at the entire expense of Government. The same
ope in which small farms prevail, while in the
re provides board and education for a number of
entirely at the expense of the State, and if such
to do as much in this Presidency."

overnment this letter seemed (one member
eir views to a considerable extent, and they
educational scheme until further information
Presidency had been collected.

apprentices were being trained at Sydapet,
y report for the official year ending 31st of
se apprentices:—

circumstances under which they were placed, these
ave made but very little progress towards qualifying
ntships; however, they are not to be blamed on this
hat Hindu youths, without any knowledge whatever
the space of three years, by mere field employment
the Superintendentships of District Farms. Such
qualify them to manage small farms of their own,
the Sydapet Farms, and it should qualify them for
intendence; but it could not in reason be expected
f theoretical and practical training in the lecture-
alty whatever in training educated native youths

h 1875, Government reviewed generally the
instruction and expressed the opinion that
was beyond present requirements, it was,
he means at hand for the commencement of
ngly directed the Board, in communication
nder which a definite course of instruction

d, No. 969, dated the 20th of April 1875, I
detailed scheme called for by Government.
itted it in the form of a draft prospectus; this,
s, was sanctioned by Government.

this revised prospectus:—

BJECTS.

"This institution is designed to affor
practical application of sound principles in

struction in the science of agriculture and in the
fucting the ordinary agriculture of this country.

"MANAGEME NT, &c.

"This institution will be attached to the Educa ional Department under the general control of the Director of Public Instruction, acting in comm unication with the Board of Revenue. The direct management of the institution will be entru sted to the Superintendent of Government Farms, who will conduct all correspondence rega ling the institution, will issue all notices, orders, &c., regarding the delivery of lectures and ther matters connected with the routine of the institution, and will maintain discipline amon/st the students who will, in all things, be subject to the orders he may issue.

"INSTRUCTI ON, &c.

"The course of instruction will extend over th ee years; there will be two sessions in each year, a Summer Session and a Winter Session; t e Summer Session will begin each year on the 1st of April and will end on the 30th of June; he Winter Session will begin on the 1st of October and will end on the 31st of March. Th ugh in the Winter Session class-room and lecture-room instruction will not begin until the 1 t of October, students will nevertheless be expected to attend at Sydapet on the 1st of Septemb r, in order that they may witness and take part in the important field operations conducted at hat season in connexion with the sowing of the cold-weather crops.

"The instruction given in the institution will embrace a thorough study of agriculture and of such portions of Chemistry, Geology, Zoology, B tany, and the Veterinary Art as bear on the theory and practice of agriculture. In addition to these special subjects, the following will also receive attention:—Farm book-keeping, land-surv ying, mensuration, and drawing. The instruction will be given by means of lectures, class-r om discussions, and field classes.

"During the portion of the day set apart for p actical instruction in farming out of doors, every student will be expected to take part in wh tever work is going forward on the farm; compliance with this regulation will be strictly enfo ced. Each student will be expected to make himself acquainted with all the operations daily per rmed on the farm, and will be required to keep a journal or diary of the same.

"Instruction will be conveyed in the English l nguage, but the Masters will afford as much assistance as possible in explaining the lectures, a d instruction generally, to students whose limited acquaintance with English may make it d fficult for them to follow such instruction without explanation.

"ADMISSION.

"Europeans, Eurasians, and Natives of all class s are eligible for admission into the institution when vacancies exist, on complying with the following conditions:—

"Candidates who desire to avail themselves of stipendiary studentships or scholarships must be between sixteen and twenty-four years of age, and must produce with their application for admission the following certificates:—

(*a.*) Certificate of age.
(*b.*) Do. of character.
(*c.*) Do. of physical fitness.*

"For the present no fee will be charged excep in the case of students who enter only for instruction in special subjects; strict conformity w th all the rules of the institution will be enforced.

"Students must provide themselves with all necessary text-books, stationery, &c.

"Students who have passed the Matriculation or General Test Examinations will be eligible for admission without undergoing any further exami ation, provided they produce the certificates needed, and comply with the other conditions laid d wn. When there is a greater number of these candidates than there are vacancies to fill, a se ection will be made of the most promising, at the discretion of the Superintendent.

When there are more vacancies to fill than the e are candidates qualified, as stated in the preceding paragraph, the entrance examination will e as follows:—

English.—Ability to write correctly and leg bly from dictation and express themselves with reasonable correctness and intelligenc in a letter or in a report.

* Should state that the candidat has been vaccinated.

Arithmetic.—The first four simple a compound rules, vulgar and decimal fractions.

Vernacular.—Tamil or Telugu (in t case of Europeans and Eurasians only); ability to translate into English easy tences from an elementary vernacular prose work commonly used in schools.

History.—The leading facts of the l stories of India and England.

Geography.—The Outline of Geogra y generally and the Geography of India in particular."

"STIPENDIA Y STUDENTSHIPS.

Of the students who have at the close the first session been most successful, twenty-four will be selected to fill stipendiary studentsh , to be established by Government, to which will be attached a monthly salary of Rupees 12-8 in the latter half of the first year, Rupees 15 per mensem in the second year, and Rupees 17- per mensem in the third year, under the following conditions :—

No stipend will be increased until t prescribed examinations have been satisfactorily passed. The stipend will be liable to be fo ited in part or in whole for continued disobedience to orders or neglect of duty, and no person ho holds a stipendiary studentship will continue to hold it if found to be unfit to undergo fu her training from incapacity or want of interest. No stipend can be held for more than two d-a-half years, and cannot be retained unless the recipient pass for the higher grade within t lve months."

"SCH OLARSHIPS.

Three scholarships, each of the value Rupees 10 per mensem, and tenable for two years under certain conditions, will be given to e three students who, at the end of the first year of training, secure the largest number of mar and who, in other respects, have given satisfaction. These scholarships are to be held under the me general conditions as are applicable to stipendiary studentships."

"AGRICULT RAL CERTIFICATE.

At the conclusion of the course of tra ng, each student who is found to possess the necessary knowledge, and whose conduct has b satisfactory, will be entitled to a certificate, certifying to his qualifications as an agriculturi "

"SCHOOL-TEA HERS AND OTHERS.

Arrangements will be made under ich young men, who are studying in Madras to qualify themselves as school-teachers, will permitted to attend one or more courses of lectures and to undergo a partial training in pr ical agriculture at the institution, with a view to teaching this subject in middle-class and el entary schools that may come under their charge."

" ENERAL.

Land-owners and others may enter dents at the institution under the same rules and regulations as Government Stipendiary St nts, provided the stipends are paid regularly one month in advance to the Superintendent, overnment Farms, by whom these stipends will be disbursed under the rules prescribed.

Persons of any age above sixteen who ossess a fair knowledge of English may enter the institution to study any special subject or s jects taught therein. They will be required to pay a fee of Rupees 2 per mensem during th me their names are entered in the register of the institution.

"Curr LUM OF STUDY.

rst Year.

Agriculture—Elemen y.
Zoology.
Chemistry—Inorgani .
Veterinary—Animal
Botany—Vegetable ysiology and Anatomy.
Drawing—Elementa ysiology.
Land-surveying and nsuration.

Second Y .

Agriculture—Crops and Stock
Geology—Elementary.
Chemistry—Organic.
Veterinary—Therapeutics and Materia Medica.
Botany—General.
Drawing—Plans.
Land-surveying and Mensurat n.

Third Year.

Agriculture.
Geology—Agricultural.
Chemistry—Agricultural.
Veterinary—Pathology.
Botany—Agricultural and Ho ticultural.
Drawing—Machines, &c.
Mechanics, Farm Book-keeping, &c."

Time Table.

Monday	6 to 10 A.M.	Field C ss	Land-surveying.
	3 to 4 P.M.	Class R om	Arithmetic.
	4 to 5 do.	Lectur	Agriculture.
	5 to 6 do.	Practic Farm Work.	
		Practic Farm Work.	
Tuesday	6 to 7-30 A.M.	Lecture	Veterinary.
	9 to 10 do.	Class Ro m	Mensuration.
	3 to 4 P.M.	Lecture	Botany.
	4 to 5 do.	Practica Farm Work.	
	5 to 6 do.	Practica Farm Work.	
Wednesday	6 to 7-30 A.M.	Lecture	Chemistry.
	9 to 10 do.	Class Ro m	Arithmetic.
	3 to 4 P.M.	Lecture	Zoology.
	4 to 5 do.	Practica Farm Work.	
	5 to 6 do.	Practica Farm Work.	
Thursday	6 to 7-30 A.M.	Lecture	Veterinary.
	9 to 10 do.	Class Room	Mensuration.
	3 to 4 P.M.	Lecture	Agriculture.
	4 to 5 do.	Field Class	Do.
	5 to 6 do.	Practical Farm Work.	
Friday	6 to 7-30 A.M.	Lecture	Chemistry.
	9 to 10 do.	Class Room	Arithmetic.
	3 to 4 P.M.	Lecture	Botany.
	4 to 5 do.	Field Class	Do.
	5 to 6 do.	Practical Farm Work.	
Saturday	6 to 7-30 A.M.	Weekly Examination.	
	8 to 9 do.		

12. Under the orders of Government this prospectus was published in the *Fort St. George Gazette* and in the local *Gazettes* o this Presidency, and soon afterwards numerous applications for admission into the stitution, began to be received from candidates resident in various parts of this Presidency and in the Presidency of Bombay.

13. At first, it was intended to op the institution in the beginning of October, but various circumstances combine to prevent the carrying out of this intention. Before the middle of September, 3 young men had entered their names as candidates for admission into the College, t whole of these produced the necessary certificates of age, physical fitness, va ination and character. Of these, 17 were qualified for immediate admission in the institution, having passed the Matriculation and other examinations prescri ed. The remainder, 26, entered their names as intending competitors at the entran e examination. The entrance examination was held at Sydapet, and at the head-q arters of 2 or 3 districts, on the 23rd

October; and of the candidates who a ded, 12 were selected and admitted into the institution. But, before the institutio egan its work, a number of the first accepted candidates asked for, and were granted ermission to withdraw their names from the roll of the institution, chiefly on accou of the famine rendering it impossible, in the majority of the instances, for the paren of the youths to bear the additional cost of the maintenance of their sons at Sydap . For the vacancies thus caused there were, however, numerous candidates, and fro the best of these who had passed the Matriculation or other examinations prese bed, and who, had produced certificates of physical fitness, &c., I selected a num r, sufficient for the accommodation available. These accepted candidates were as follo :—

9 Parsees.
10 Brahmins.
10 Vellalars and other ca s.
1 Native Christian.

They belonged to the following places :—

3 South Canara District
3 Coimbatore District.
3 Chingleput District.
1 North Arcot District.
7 Madras District.
1 Tanjore District.
1 Trichinopoly District.
9 Districts of the Bomba Presidency.
1 Ceylon.
1 Mysore.

30

14. The ages of these men were ;—

Nine aged from 18 to 20 ears.
Nine aged from 20 to 22 ears.
Twelve aged from 22 to years.

15. The great difficulty experienc , in starting the institution, was the absence of the necessary house-accommodation. Eventually it was decided to make use of, as a temporary arrangement, the granary l ilding attached to the Sydapet Experimental Farm. This is a two storied building nd consists of two rooms on the ground floor and one upper room. This building, ough very commodious as a granary, is very inconvenient and insuitable for the purposes of the Institution; the height of the ooms on the ground floor, is less than 9 feet, and, the class om, which is only 30 × 20 feet, is therefore exceedingly close and hot, when it con ins the usual class of 30 adults. The upper room, used as a lecture room, is 60 feet ng and 20 feet broad, the height of this room to the wall plates is not more than 6 fe , but the roof is open to the ridge plate, which affords better ventilation than is the ca with the rooms on the ground floor; but this room is almost as ill adapted for use as lecture room as are the ground floor rooms for use as class rooms; when there are, as i frequently the case at the agricultural lectures, as many as 50 adults in the room, is exceedingly uncomfortable; and, from the narrowness of the room, many of he students are necessarily seated so far back from the lecture platform, they, no only experience great difficulty in seeing distinctly the drawings made during l tures on the black board, but also, occasionally, find it difficult to hear the lect er fully. It is impossible to keep the room moderately cool in the hot season, for e walls are exposed fully to the sun, and the windows are altogether without verand s or shades; and, from the room being already dark when the sky is at all clouded, the indows cannot be furnished with shades; and another very serious inconvenience wh h arises from the absence of window shades, is the impossibility of keeping the rain i n drifting across the room when there is even

Unsuitability of house-accommodation.

only a very slight wind during a showe On such occasions, I have had no alternative but to dism the class; for, if the window shutters were closed, the room w uld be so darkened that no work could be done; glass window would render the room too hot. Light as the rains were during the past session, had on several occasions to close the Institution from the impossibility of lectures bei ng delivered in the room while rain was drifting through it. I ook upon the absence of proper accommodation, in the shape of lecture rooms and class rooms, as a most serious detriment to the work of the institution. Plans and estimates have bee prepared, and approved, for providing the necessary buildings, and the funds requi ed are available, I venture to hope therefore that before the expiration of another year the necessary accommodation will be provided.

Institution had to be closed in wet weather.

The absence of proper house-accommodation a serious detriment to progress.

16. His Highness the Holkar founded t o stipendiaryships connected with the institution, each of the value of Rupees 25 per mensem. For these stipendiaryships two young men were selected and sent to the College by the Minister of His Highness the Maharajah. These young men signed an agreement by which they undertook to serve the Government of His Highness the Holkar, as Agricultural Instructors, after the completion of their training in the College. The action of Hi Highness the Holkar in this matter is very encouraging; it is greatly to be desired at the example should be extensively followed.

Holkar State Stipendiaryships.

17. The accommod tion being so limited only two or three students could be a lmitted to study special subjects.

Students studying special subject.

18. Arrangements were made whereby ome of the students of the Normal School in Madras, could attend the Agricultural Lectures; of these students 13 attend d. These are Matriculates and First Arts men. They are intended to be teachers in higher-class, Middle-class, and Normal Schools. Some of them may become masters i schools in which agriculture will be taught. Others may, as Deputy Inspectors, have to examine schools in which agriculture will form a part of the curriculum.

Normal School Students.

19. During nearly the whole of the Session applications for admission into the institution were frequent y received. The following statement shows the number of these applicants, and the District, Province, or Presidency to which they belonged :—

Applicants from Madras District		31
Do.	Chingleput District	16
Do.	North Arcot do.	8
Do.	Salem do.	1
Do.	Mysore Province	1
Do.	Tanjore District	30
Do.	Trichinopoly District	2
Do.	Coimbatore do.	9
Do.	Malabar do.	1
Do.	South Canara do.	6
Do.	Madura do.	3
Do.	Tinnevelly do.	1
Do.	Kistna do.	1
Do.	Bombay Presidency	31
Do.	Bengal do.	1
Do.	Punjaub Province	1
Do.	Oudh do.	1
Do.	Ceylon	1
	Total	145

Numerous applications for admission.

20. The next statement shows t[illegible] caste or nationality of these applicants—

Brahmins	63
Parsees	26
Vellalars	8
Idaiyars	5
Vanniars	12
Chettics	3
Christians	3
Mussulmans	2
Kammalars	2
Kshatriyas	1
Unknown caste	20
Total ..	145

We were quite unable to accommodat[illegible] more students, and I had, most reluctantly, to refuse to admit many, apparently, ver[illegible] eligible candidates.

21. It is a matter of some intere[illegible], and I think a very promising sign, the large proportion of these applicants that w[illegible]e Brahmins. The Brahmins are, in the agricultural districts of this Presidency, t[illegible] leaders of the people, and are much looked up to by the cultivators for advice in the[illegible]anagement of land. It may not be generally known that one-quarter of the entire[illegible]ale Brahmin population consists of cultivators, and about 12 per cent. of land-holde[illegible]; thus more than one-third of the entire male Brahmin population is actively enga[illegible]d in pursuits connected with the land. The large number of Parsee candidates was[illegible]so a very encouraging sign. If these enterprising go-a-head people turn their atten[illegible]n to agriculture, much good may be looked for. In many respects Parsees are parti[illegible]arly well suited to be agriculturists. It is to be hoped that the College may be t[illegible] means of inducing many of them to devote themselves to agriculture, which sadl[illegible] needs a little of that energy and enterprise which has been so conspicuously shov[illegible] by Parsees in commercial and manufacturing enterprises.

22. I would particularly invite [illegible]ention to the numbers of eligible candidates who from so many parts of India soug[illegible] admission into the institution. In the earlier part of this report in the second [illegible]ragraph I drew attention to the difficulties experienced, only as recent as 1871, [illegible] inducing eligible persons to offer themselves for a course of training in agricultu[illegible] even when the inducements offered were of a most substantial kind. The change[illegible]hat has taken place in the opinions of the educated youth of this country, regar[illegible]g agriculture as a field of employment, must, I think, be very gratifying to all who [illegible]esire to see this country prosper.

23. The institution did not begi[illegible] work until the middle of November. A very efficient staff of lecturers was appoi[illegible]d to instruct the students; the majority of these gentlemen, were already engag[illegible]d in teaching, in the Madras Medical College. The subjects of instruction were;—

Agriculture—Soils and Man[illegible]es.
Veterinary—Animal Physiol[illegible]y and Anatomy.
Botany—Elementary.
Chemistry—Inorganic.
Zoology—Mammals and Bird[illegible]
Arithmetic—Decimals, Rule[illegible] Three, &c.
Mensuration—Principles of G[illegible]metry and Mensuration of surfaces.
Surveying—Measurement of[illegible]all areas with the chain.

On each of these subjects a course of l[illegible]ures was delivered. The following extracts, are from the reports of the lecturers a[illegible]others on the work of the past Session:—

W. R. ROBERTS[illegible], M.R.A.C., (AGRICULTUR[illegible]).

"The class met 44 times; 28 of t[illegible]e meetings were devoted to lectures, 13 to field classes, and 3 to formal examinations.

"The class was composed of 45 members, 13 of [illegible]vhom were students of the Normal School.

"The attendance of the students was very s[illegible]isfactory. The Normal students unfortunately, owing to their vacation falling during the Se[illegible]ion, were able to attend only 2 lectures.

"I was very much gratified with the progress m[illegible]ade by the class generally. The conduct of all was good.

"The lectures delivered were generally on soils [illegible] and manures. At the field classes attention was chiefly directed to the practical illustrations a[illegible]forded in the fields to the instructions given in the lecture-room. Owing to the prevalence of the[illegible] drought ordinary agricultural work was not so active as usual, but many valuable lessons were l[illegible]earnt as to the means available to the agriculturist for modifying the ill-effects of such unfavo[illegible]rable seasons."

G. WESTERN, M.R.C.V. [illegible] (VETERINARY).

"The class met 22 times, and the allotted ho[illegible]ur was occupied with lectures, anatomical demonstrations, and occasional *viva voce* examinations. The class consisted of 30 students.

"I have found the members of the class throughout the Session attentive and eager to learn, and have been agreeably surprised at the very creditable papers written by the majority at the examinations. I must however, I regret to state, except some four or five from this general commendation.

"I have experienced much difficulty in procuring specimens to illustrate my lectures, and fear that in consequence the matter thereof has not always been so well understood as it might otherwise have been. This might be remedied in future by procuring a good selection of anatomical models and diagrams of the more important parts and organs of animals from Europe. For diagrams I have hitherto had to depend entirely on what I could prepare privately or obtain on loan from the Curator of the Government Central Museum, and I am much indebted to that officer for assistance in this respect.

"The instruction hitherto given has been of the most elementary description, my intention being to give a general outline of the structure and functions of the organs of the animals of the farm, and subsequently to reconsider the various branches of the subject in the order of their importance and interest to the agriculturist."

R. WILKINS, F.R.[illegible], (BOTANY).

"At the commencement of the Session there w[illegible]e 16 students in the class; very shortly afterwards the number was increased to 32.

"Lectures on the subject were delivered bi-weekly; the number up to 31st March amounted to 22. They embraced an account of roots, stems, leaves, and flowers, and were illustrated by sketches on the black-board and by fresh and dried specimens.

"One oral and three written examinations were held, for which marks have been assigned. In addition to these, the class was examined for a few minutes at a time, at every meeting, on the subject of the previous lecture.

"All the students conducted themselves well, and I am satisfied with the progress made by most of them; a few have not done well."

W. HAMILTON, [illegible] (CHEMISTRY).

"The number of meetings has been 29. Three examinations were held, two class and one sessional. In addition the students were examined at each meeting, for 20 minutes, on subjects which were considered in the previous lecture.

"The lectures were, as far as practicable, illustrated by experiments.

"At the commencement of the Session there were 16 men. Fresh admissions were granted from time to time, until the total number on the roll amounted to 32.

"The conduct of the students has been unexceptionable, and their industry good. Many of the men in the class are intelligent, and have evinced a fair degree of aptitude in grasping the facts and theories of the subject. A few from defective preliminary training and inadequate knowledge of English have kept far behind the others. About one-half of the class have made good progress."

J. KEES

" The class met 14 times during the
two written examinations.

" Mammals and birds formed the s
interest in the subject of zoology.

" The behaviour of the class has been

A. GANAPATI

" The class met 24 times; 22 lessons
studied were Decimal Fractions and Simpl

" The class consisted of 28 students.

" The conduct of the class was on
exceptions acquitted themselves very credit

T. V. SEETHARAM MOO

" The class commenced on the 15th J

" The subjects taught were: Princip

" The Surveying class met seven time
The conduct of the class during the Sessio

24. The cottages on the Farm,
apprentices, have been rented to the st
for the number of students who desire
made for building several more. The
the residence of the students on the F
more desirable that they should reside

25. A Reading-room has been fitt
made good use of it. The room is pro
to the extent that is desirable.

26. A beginning has been made i
collection of grains and pulses has bee
Lectures on Animal Physiology have
Central Museum, to whom, also, we are
species found in the Adyar river.
diagrams, as well as some models and
Secretary of State for India.

27. A Laboratory is urgently nec
cannot be as practical as is desirable.

*28. It is to be regretted that th
very few lectures; the causes were pa
on their time having on one or tw
Agricultural Lecture, and partly, fr
Institutions; the Normal School stud
our Session began, and the new cla
in our Session that I, and the Pri
thought that the students could no
Lectures, then so near the end of t
lectures. The arrangements for the
the Agricultural Lectures, will re
convenient as regards the Agricultur

G.D., &C., (ZOOLOGY).

rse of the Session, and had one oral examination and

ect of my lectures. The students exhibited great

exceptionable."

YER, F.A., (ARITHMETIC).

e given and two examinations held. The portions
ule of Three.

whole satisfactory, and the students with a few
at the examinations held during the Session."

LLY, (MENSURATION AND SURVEYING).

ary 1877 and met 11 times.
Geometry and Mensuration of surfaces.
The work done was only surveying with the chain.
s good."

ich had been built for the occupation of the
its; and, as these cottages were not sufficient,
reside on the Farm, arrangements have been
inal educational scheme did not provide for
; but it is certainly, in every way, much
e, than in the town of Sydapet.

p for the use of the students, who have
d with Agricultural News-papers, but, not

rming an Agricultural Museum. A fair
med. Several skeletons for illustrating the
received from the Superintendent of the
lebted for several stuffed fish of the different
s of Botanical, Zoological and Mechanical
microscopes, have been received from the

; without it the instruction in Chemistry

ormal School students were able to attend so
from the demands of their own institution
asions prevented their appearance at the
he difference in the Sessions of the two
having been dispersed very shortly after
n the Normal School was formed so late
l of the Normal School agreed with me,
ofit much by attending the Agricultural
ourse, from having missed the preceding
ndance of the Normal School students at
e to be reconsidered. Our Sessions, are
asons here, and it is therefore very undesir-

* During the Summer Sessio few lectures were unattended by them.

able to alter them; and it is probably as un lesirable to alter the Sessions of the Normal School. If more satisfactory arrangem nts cannot be made for the agricultural education of the students of the Normal School, it will become a matter for serious consideration, whether it would not be b tter to impart agricultural information, in a few of the principal schools of the Presidency, by means of men who have gone through the entire course of training at the Agricultural College, either, in addition to the means now proposed, or, in substitution for them. Perhaps, a system could be adopted, something similar to that of the Scienc and Art Department at Kensington in conducting technical and scientific education i different parts of England.

29. The following statement, shows the m rks obtained by each student (Normal School students excepted) at the examinati ns, and, for attendance, during the Session:—

Statement showing the Marks obtained by the Students during the Winter Session ending the 31st of March 1877.

Rank Number.	Name and Register Number.	Full Marks	Agriculture, 27th January 1877.	Veterinary, 3rd February.	Chemistry, 10th February.	Arithmetic, 12th February.	Botany, 17th February.	Mensuration, 22nd February.	Zoology, 24th February.	Agriculture, 3rd March.	Arithmetic, 5th March.	Veterinary, 10th March.	Chemistry, 17th March.	Botany, 24th March.	Mensuration, 4th April.	Agriculture, 26th March.	Veterinary, 27th March.	Chemistry, 28th March.	Botany, 29th March.	Zoology, 4th April.	Total.	Attendance Marks.	Grand Total.
			SESSIONAL EXAMINATIONS.																				
			WEEKLY EXAMINATIONS.																				
1	10. G. Krishna Prabhu	100	68	81	85	100	95	65	90	94	86	91	74	77	88	*275	178	172	195	185	2,097	112	2,209
2	5. N. H. Patuck	100	56	82	84	74	79	87	76	94	82	96	96	74	81	266	169	200	170	125	1,993	118	2,111
3	26. C. K. Subba Row	100	74	84	84	73	80	74	65	76	99	83	88	71	88	273	138	151	178	135	1,938	120	2,058
4	14. V. S. Gurunatha Pillay	100	83	45	82	90	84	95	75	84	98	56	57	60	61	248	135	104	160	100	1,574	114	1,688
5	4. A. D. Colah	100	69	65	62	84	89	74	78	86	62	86	55	77	77	271	87	82	156	165	1,561	116	1,677
6	2. P. D. Moody	100	46	65	63	82	61	66	68	76	36	70	75	63	80	259	136	135	165	165	1,464	112	1,576
7	9. B. Ramiah Reddy	100	80	76	68	68	71	76	68	84	32	79	62	63	35	237	136	92	135	115	1,445	91	1,536
8	Ramalay Moodely	100	61	69	57	64	54	68	60	74	38	61	59	69	18	248	90	84	121	100	1,406	119	1,525
9	J. M. Chinnasawmy Chetty	100	60	44	52	58	61	56	70	53	41	58	42	62	53	197	84	108	140	95	1,405	108	1,513
10	K. M. Nagojee Row	100	72	37	49	61	59	62	68	61	50	46	53	38	26	246	108	108	129	105	1,289	118	1,407
11	B. Krishna Row	100	78	51	61	82	52	61	74	57	17	38	56	41	6	213	74	87	164	120	1,289	116	1,405
12	P. V. Sreenivasa Iyer	100	66	53	64	62	59	64	71	68	39	62	43	50	53	250	116	112	156	129	1,377	115	1,492
13	K. M. Rego	100	57	64	54	48	55	68	61	68	45	46	53	49	26	210	91	121	112	140	1,267	120	1,387
14	T. Balasundracharry	100	57	54	40	55	74	76	59	74	58	62	56	42	38	266	88	121	181	90	1,252	119	1,371
15	T. D. Colah	100	57	64	48	65	55	68	64	53	55	48	62	45	41	213	49	62	128	105	1,176	120	1,295
16	A. H. Kotwal	100	61	54	48	65	55	68	64	53	55	48	62	45	41	213	49	62	128	105	1,176	120	1,295
17	E. N. Kanhetta	100	63	63	55	68	74	76	68	80	36	62	56	74	53	224	52	76	163	90	1,247	120	1,367
18	M. Dadiseta Moodelly	100	73	68	74	71	76	71	68	84	40	74	71	61	59	230	56	30	114	85	1,177	120	1,297
19	A. Moorooguss Pillay	100	38	28	41	41	59	59	61	59	60	59	59	57	59	210	46	31	122	56	1,057	120	1,177
20	T. Varadhiah	100	33	35	41	41	59	59	61	59	60	59	59	57	59	143	34	42	99	56	1,057	120	1,177
21	B. M. Dadiseta Thamodara Naidu	100	68	71	43	68	71	76	68	80	36	62	56	74	53	224	52	76	163	90	1,247	120	1,367
22	E. N. Sowrulinga Naicker	100	71	25	15	17	43	62	68	80	36	62	56	74	53	224	52	76	163	90	1,247	120	1,367
23	M. N. Jagannada Moodelly	100	51	43	8	17	43	62	68	80	36	62	56	74	53	224	52	76	163	90	1,247	120	1,367
24	P. Lally	100	36	7	..	17	43	62	68	80	36	62	56	74	53	224	52	76	163	90	1,247	120	1,367
25	J. F. Lally	100	60	31	..	17	43	62	68	80	36	62	56	74	53	224	52	76	163	90	1,247	120	1,367
26	C. S. Sreenivasa Row	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	2,400	122	2,522
27	C. Cuppuswamy Archary	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	2,400	122	2,522
	Full Marks		2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	64,800	3,294	68,094

30. In the Appendix will be found copies of the examination question-papers of the Session, these will afford a very fair idea of the character of the instruction given in the College.

31. The prizes for Note books, were awarded as below :—

Agriculture	1st,	N. H. Patuck.
	2nd,	V. S. Gurunatha Pillay.
	3rd,	A. D. Colah. / B. H. Kotwal.
Botany	1st,	B. H. Kotwal.
	2nd,	A. D. Colah.
	3rd,	V. S. Gurunatha Pillay.
Veterinary	1st,	A. D. Colah.
	2nd,	M. Narayana Row
	3rd,	N. H. Patuck.
Chemistry	1st,	P. D. Moody.
	2nd,	B. H. Kotwal.
	3rd,	V. S. Gurunatha Pillay.
Zoology	1st,	B. H. Kotwal.
	2nd,	V. S. Gurunatha Pillay.
	3rd,	A. D. Colah. / N. M. Rego. / N. H. Patuck.

32. The expenses incurred, on account of the institution, are shown in the next statement :—

—	August.	September.	October.	November.	December.	January 1877.	February.	March.	Total.	Grand Total.
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
Agricultural Lecturer ..	....	....	....	....	....	....	....	....	....	
Veterinary do. ..	....	....	....	....	....	....	....	....	....	
Chemical do. ..	....	....	....	....	20 0 0	120 0 0	140 0 0	160 0 0	440 0 0	
Botanical do. ..	....	....	....	....	20 0 0	140 0 0	140 0 0	160 0 0	460 0 0	
Zoological do. ..	....	....	....	....	20 0 0	140 0 0	140 0 0	140 0 0	440 0 0	
First Master ..	....	....	....	150 0 0	20 0 0	80 0 0	100 0 0	80 0 0	280 0 0	1,620 0 0
Second Master ..	....	....	....	....	150 0 0	150 0 0	150 0 0	150 0 0	750 0 0	
.. ..	....	....	....	....	....	....	54 13 5	100 0 0	154 13 5	
.. ..	25 0 0	25 0 0	25 0 0	25 0 0	25 0 0	25 0 0	25 ..			
Draftsman ..	....	....	....	....	20 13 4	24 3 1	24 0 0	23 3 5	97 3 0	
Mudlee ..	....	....	....	4 15 2	4 0 0	6 11 10	10 2 1	9 8 0	30 5 11	
Peons and other servants.	....	....	....	....	13 11 3	23 0 0	27 4 2	26 0 0	89 15 5	1,522 5 9
Special Charges.									1,522 5 9	
Furniture ..	177 12 4	775 11 5	113 8 5	214 5 7	14 12 9	35 10 0	119 10 0	41 4 6	1,492 11 0	
Accommodation ..	....	271 0 8	87 10 11	38 4 7	134 13 0	209 8 7	16 2 0	12 6 6	769 14 8	
Contingencies ..	62 4 6	....	51 12 9	108 0 11	26 0 6	67 14 11	29 12 7	44 0 0	389 14 2	
									2,652 7 5	
								Total ..	5,594 13 2	

WILLIAM ROBERTSON, M.R.A.C.,
Superintendent, Government Farms.

29th September 1877.

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THE CAROLINA PADDY EXPERIMENTS

IN THE

MADRAS PRESIDENCY.

INTRODUCTORY.

During the past 7 or 8 years a considerable number of reports have been submitted to the Board of Revenue, on experiments with Carolina paddy; some of which contain much useful information. It was thought that if this information could be collected, it would be of use to persons desirous of engaging in Carolina paddy culture in this Presidency. Accordingly, the reports were placed in my hands, in view to the utilization, in a general report, of whatever useful matter they might be found to contain.

2. I have done what I could in the desired direction, but the result is altogether disappointing, from the absence in so many of the reports of the necessary details. I first attempted to classify the results of the experiments, with reference to the climatical conditions under which each was obtained, but I found it impossible, except in a very few instances, to procure the necessary meteorological data, and this course I had to abandon. I next endeavoured to classify the experiments, according to the description of soil on which each was conducted, but, from so many of the reports being silent as regards the soil used, this course also, I found impracticable. Next, I attempted to work up and arrange the results according to the peculiarities of culture adopted in each instance, but this likewise, I had to give up from the frequent absence of the required information.

3. Unfortunately, a very large proportion of the reports are valueless from being but the records of failures, from such causes as "floods," "trespassing cattle," "the depredations of birds, insects, &c.," "the failure of water-supply &c., &c." Nevertheless, a considerable amount of useful matter has been collected which, I trust, will be of use to those interested in paddy culture in this Presidency.

4. The numerous extracts I have taken from the reports, have been arranged, generally, as they bear on the crop during growth from seed time until harvest time. A Manual, or Guide, would probably have been more useful than this compilation, but it was desirable to give as far as possible the experiences and opinions of Experimenters located in different parts of the Presidency; and, such a Manual, or Guide to the cultivation of Carolina paddy, prepared with our present limited knowledge, could have been applicable only to the conditions met with in a small area of country.

5. I have endeavoured to show, generally, what has been effected in Carolina paddy culture, under moderately good agricultural conditions, and, generally, the means, by which such results were obtained. Had it been possible to give the exact conditions, history and results in full detail, of a few experiments made in each of the different Collectorates, the information afforded, would have been much more valuable than that now submitted. Though, in recording the history of their experiments, some Reporters have entered fully into details as regards some points of interest, they have, in many instances, overlooked others of equal value, without which the details given are of much less value than otherwise they would have been. I am conscious

that, the connection between the different yields obtained, and the different modifications in the cultivation practices followed, cannot be traced in this report; but, the material available would admit of no other treatment than that I have adopted.

6. The deficiencies of this report however, as a guide to the cultivation of Carolina paddy, are fully compensated for, by the ample, and exact information afforded, regarding the culture of the plant in its home, in America, which I have placed at the end of this report; the more nearly the methods of culture adopted in Madras, approximate to the method of culture adopted in America, the more likely will successful results be secured. That the climate of Madras, generally, is suited for the Carolina paddy plant has been amply proved. It remains for the Indian cultivator, by adopting an intelligent practice to secure to the plant those good agricultural conditions which, in America, it invariably meets with.

7. In 1869, a large quantity of Carolina paddy of the "gold seed" variety was purchased in America for shipment to India. Of this lot 150 barrels were forwarded to Madras. The Madras supply reached its destination early in 1870; it consisted of 300 bushels; the whole of the grain was perfectly fresh, and contained 92 per cent. of vital seed. In 1872 a further supply, a few barrels, of fresh seed was imported. The quality of the grain was quite equal to that of the supply received in 1870. In 1873, another small supply of fresh seed was received; this grain was also in good order, but it contained only 87 per cent. of vital seed and it was mixed with about 3 per cent. of the grain of an inferior paddy, known to American Planters as "Volunteer" paddy. In all, since 1870, about 400 bushels of Carolina paddy seed have been introduced into this Presidency, and with the exception of the drawbacks noticed, regarding the supply of 1873, the whole was of first-rate quality. The seed was, in most instances, supplied to Experimenters gratis, and delivered free of charge. It was widely distributed in all parts of the Presidency where paddy is cultivated.

Large importation of seed from America.

The whole of the seed good.

Seed widely distributed over the Presidency.

The Soils, and their preparation for the Crop.

8. The soils were ordinary paddy soils under irrigation from river-channels, or tanks; generally situated at low levels, and of alluvial origin. The land frequently was terraced, which arrangement admits of the thorough removal of the irrigation water when done with. Much of the land was however so situated that it could not be drained excepting by artificial means, and, the Ryot has not yet recognized the importance of getting rid of the irrigation water after it has fulfilled its purpose, by such means.

No means provided for escape of stagnant water.

9. In preparing the soil, the ordinary native methods were usually adopted; these, varied considerably in different parts of the Presidency. In some localities the land was ploughed 7 or 8 times when intended to receive seedling paddy plants. During this preparation, the soil was generally kept covered with water to a depth of 3 or 4 inches; in this way the surface soil was worked by the ploughs into a semi-liquid mud while the layer of soil, immediately below, was puddled and hardened by the feet of the cattle. In some instances, while undergoing preparation, this continued over several days, the soil was manured with the green plant of the Mudder (*Calotropis gigantea*), with indigo, &c., and with the leaves of different descriptions of trees, at the rate of from 400 to 1,000 lbs. per acre; but, most of the land was unmanured excepting by the silt deposited on it by the irrigation water.

Soil worked into mud.

Manure.

10. Usually, the soil was prepared for seed in much the same way, as when intended to receive seedlings. In either case, the surface was worked into a puddle, the process being more thoroughly performed when it was intended to plant seed. The following extracts, from the reports, show how this puddling process was carried out:—

"After standing thus for two days until thoroughly saturated, water was again let on the field to the depth of 2 inches. On the following day the land was again

ploughed thrice and the mire left to stagnate for two days after which it was manured with street sweepings, cattle litter, &c. On the following day the field was again ploughed three times and watered to the depth of one inch, the surface of the mire being smoothed by means of a plank drawn by bullocks; after this the soil was manured with leaves and green plant which were trodden into the puddled soil."

"The plots were puddled and worked according to the usual Native system. The manure was put into the puddle and worked thoroughly amongst it by means of the plough. The seedlings were not planted out until the first effects of the rapid putrefaction of the manure had passed off. * * * Before planting commenced the soil was again thoroughly puddled. The plants were put down in bunches of two or three, placed about eight or nine inches apart; they were usually pressed into the puddle by the hands of the coolies; very little pressure was required; the puddle was so soft, eight coolies planted an acre per day."

"The ground was turned up with the ordinary small plough of the country in August, one month before the seed was put down. Again five days before sowing it received two ploughings on the same day; again two days before sowing it received two ploughings; and lastly the manure, leaves, and dung were put down; the ground was again ploughed twice over, after which the seed was sown. At the time of sowing the land was under water and in a puddle."

"The grounds were ploughed up six times with the country plough. The slices of soil were well broken and the ground was then levelled. Jungle leaves were mixed through the surface of the soil, and it was left alone in that state for a period of 35 days, so that the necessary putrefaction of the leaves might take place. By that time the puddle became sufficiently putrefied and produced a noxious smell. The land was again ploughed up twice by means of the country plough."

This latter description refers to the preparation of the soil for seed.

11. In some instances, the soil was prepared without undergoing puddling. The following extract, describes this practice:—

"In this kind of sowing the Ryots generally keep the land ready well ploughed and manured and await a moderate shower of rain to commence the sowing. As soon as they get rain and the ground is sufficiently saturated the seed is sown in lines by means of a bamboo seed-drill. If the rain is heavy, they wait for two or three days till the ground is sufficiently drained. If the weather is showery, no irrigation water is applied during the first three or four weeks, and the grass which springs up in the interval is removed by frequent weedings."

12. There can be no doubt but that the puddling of the soil as described in some of the foregoing extracts, is highly objectionable. The physical character of the soil is very injuriously affected as, from the semi-liquid state into which the soil is worked, the heavier particles sink below, hence the surface soil, which is formed of the finer matter, is close and compact, a condition highly favorable to the retention of water on its surface, if this, was a result desirable to secure, but, as the good effect of irrigation water, depends upon the water *passing into and through the soil*, the condition referred to, is very objectionable. It is true that, when land has once been puddled, it is difficult, at first, to work it; in a satisfactory manner, in any other way, but, if in each year the puddling process is less fully carried out, the soil will gradually be restored to its normal condition. The puddling of the soil is done in order to make the water, apparently, go further, but, where sufficient water cannot be commanded for paddy, without thus injuring the physical state of the soil, it would be better, in every respect, to crop the soil with some other crop. Some fairly good results have been obtained in Carolina paddy culture where the soil was puddled but it is evident that, in such instances, the land was either situated at a moderately high level, which admitted of good surface drainage, or, it rested on a moderately porous sub-soil. In some instances, where the land was thoroughly worked in a dry state, before irrigation commenced, the results, apparently, were not better, than when the puddling process was adopted, but, there may have been causes to account for this, of which the reports have taken no cognizance.

The puddling of the soil objectionable.

The irrigation water should pass through the soil.

Puddling obstructs the passage of the irrigation water down through the soil.

12. The Carolina paddy plots, many instances, received better treatment, as regards manuring, than is usual in t treatment of land for ordinary paddy. This, probably, was because many of the lots were located near the head-quarters of a District, and way from the larger irrigation rivers, the waters of which, usu y, bring down so much silt that manure is not considered be needed on the land they irrigate. Owing to the swamping of the land, during rigation, it is usual, when manure is applied, which is quite the exception, to appl some substance which by gradual decay affords plant food. If a quickly acting ma re was used, the probability would be that it would all be dissolved in, or carri away by, the first irrigation flood the land received.

The experimental plots were not equally irrigated by reason of the larger rivers.

The seed, seedlings, an the method of sowing and planting.

14. As before noticed, the seed as sometimes sown directly in the land, and, at other times, it was sown in nursery ds, in view to raise seedlings for transplanting. When sown broadcast on the puddle soil, the seed was usually in a sprouted state; the process followed in sprouting it described in the following extract:—

"The seed, which is to be sown, s put in pots at sun-rise and water poured in them to the brim. The pots remain that state till evening, when some straw is placed in the mouths of each and the are turned upside down. They remain in that state all night, during which time th water drains away. The next morning water is poured in the pots, but is immedia ly run off, and the pots are inverted again as on the previous evening. In this ate they remain all day. The seed is then placed on baskets and wet straw is sp nd over each and kept on by weights. The following morning the seed begins t germinate when it is taken to the field for sowing."

15. The practice of transplanting paddy is not common throughout the Presidency. It appears to prevail more nerally in those portions where the water-supply is good and labor abundant. en where the practice is common, it is far from usual to raise the seedlings in nurser beds; frequently the Ryot sows one or two of his fields thickly, in view to the pl its to be thinned out being used for planting other ground, and perhaps it is to this ractice we must attribute some of the failures in the experiments with transplanted arolina paddy seedlings. It has been shown, again and again, that, while the root of the indigenous paddy are confined chiefly to the surface soil, those of the Caroli paddy go deep down into the soil when they meet with favorable conditions. The llowing extract from a report by the Superintendent of Government Farms dated 1 72 shows this:—

"These roots are average spe mens; they were collected off some land we ploughed on Saturday, from which cr of Carolina and country paddy had just been removed. The land is all of one deser tion and quality and the crops were cultivated in an exactly similar way. The roo illustrate in a very forcible way the different habits of the two varieties of paddy; t Carolina *feeds deep down in the soil*, while the country variety is a *surface feeder*. f is evident therefore that land with a healthy surface, only about 3 inches in depth, n *never* produce a *good* crop of Carolina paddy, though it may produce fair crops of t country variety. In such soils the Caro grows well enough until its roots beg to pass down into the unhealthy under-soil, when it sickens, turns yellow, and d ; while the country paddy, whose roots never reach this unhealthy under-surface, y thrive and yield fair results."

Many Experimenters, noticed the fficulty of taking up, uninjured, the seedling plants thus;—

"Much difficulty was experienc in pulling up the Carolina paddy plants for transplanting, the roots having struc so deep down (10 to 12 inches) into the soil."

"Difficulty was experienced in lling up the plants for transplanting the process on a given quantity of land occupi twice the time within which the country paddy seedlings could be raised from the g und."

16. An opinion appeared to be generally h ld that the Carolina plant cannot bear such ill-usage as that u) which the country plant is usually exposed when being tra nsplanted. But, the difference in the root growth of the two varieties of paddy, fully explains the matter. The evidence afforded in these reports is conclusive as to *the necessity of employing properly prepared nursery beds for raising Carolina paddy seedlings for transplanting*. Seedling plants of all ages from 20 f 50 days were used in the experiments. The general experience was, that seedlings a ed from 20 to 28 days were the most suitable for transplanting. By the use of old r seedlings there was, of course, some saving in the fewer number of days the crop r quired to be watered in the field, but this advantage was negatived, in most instances, by the more serious check these older seedlings received to their growth on being transplanted.

Transplanted seedlings injured from rough treatment.

Irrigation, and, Culture of the Crop.

17. The irrigation water was, in most c ses, derived from river-channels and tanks. The former of t ese convey to the fields river-water which has been obstructed in its downward passage to the sea by dams or anicuts. These dams or anicuts are usually placed across the river-beds in situations where there is plenty of room for storing water, and where, from the height to which the stored water can be raised, it will flow by gravitation through a channel to the land. The water of these irrigation rivers contains silt, at certain seasons a considerable quantity. The tanks, are natural or artificial reservoirs; they are usually filled by the surface drainage of the adjacent country after heavy rains; in some instances they are supplied with water from a neighbouring river, but such cases are rare. Generally the tanks are situated on sloping land so that, while they secure the surface drainage from the higher country, their water will yet flow by gravitation upon neighbouring land at lower levels.

River-channels.

Tanks.

18. The irrigation practice of the Carolina paddy Experimenters, differed but little from that usually followed in the treatment of country paddy in the portions of country where the experiments were conducted; thus;—

Irrigation practice.

"The field was not again watered until the evening of the 12th July or 5 days after it had been sown, when water to a depth of one inch was let on. From this day forth the young crop was watered twice a day, except when it rained. By the 10th of October, or just about 3 months after the seed was sown, the crop had attained its growth and came into full ear. From the 27th of October the field was only watered every alternate day to the depth of an inch; from the 6th of November no further irrigation was required as the crop was near maturity."

"The land was irrigated on each day of ploughing, that is, on four days inclusive of the day of sowing. The water was not again let on until the plants appeared above the surface which was on the third day. From that time until the crop was ripe, water was daily supplied to a uniform depth of 2 to 3 inches, but it is impossible to speak with more precision than this, because the supply over the whole field would not be uniform, that portion adjoining the channel receiving more water than that more remote."

"Water was applied daily at the rate of 2 to 3 inches in depth."

"The crop was watered every alternate day for a week after that until the harvest; there was always 1 inch of water on the land."

The next extract refers to a successful expe ment made on the Sydapet Farm with a *minimum* quantity of water, on land which h d not previously been under paddy:—

"During the growth of this crop the gr und was watered 22 times, each time with a quantity equal to a rainfall of 1½ inc es; the rainfall during 93 days from planting to reaping amounted to 14·81 inches, making the total quantity of water used nearly 48 inches, but fully one-third of the rain all was lost, from it having fallen when not required."

Several of the Experimenters re[p]or
seemed to require much less water th

"After transplanting, water was
plants, but this was found not to
yellowish color; the water was the
sufficient to keep the ground thorough
directly the excess of water was rem

"The crop was cultivated in th
watering."

"I am inclined to attribute the
causes—first, water was distributed
country paddy) and the Carolina whe
water."

On comparing the practices here desc
irrigating paddy land, *vide* the "No
what a wide difference there is. In
150 days, the land cropped is under
are two intervals each, of more than
dry crop. In this country, under ordi
prove fatal to a crop of country paddy
except under very favorable circumst

19. Except an occasional weedin
tion during growth. The practice of
one or two Districts, notably in Nello
plants, by means of a light Country
operations on the land while the Carol
one reason why in some experiments
during growth is possible, only on soil
this with paddy, is but rarely the case

hat, from their experience, the Carolina paddy
the ordinary country paddy. One wrote:—
llowed to reach to one-third the height of the
nit as the plants turned unhealthy and of a
withdrawn and allowed in quantity merely
y moist. The appearance of the crop improved
ed."
usual way, but failed evidently from over-

all yield of Carolina paddy * * * to two
equal proportion to each crop (Carolina and
I saw it appeared to have had almost too much

bed with the practice common in America in
s" at the end of this report, it will be seen
nerica, during the time the crop is growing,
ater only for about 68 days; while, there
e month, in which, the crop is dealt with as a
ry circumstances, a month of dry tillage would
nd probably, to a crop of Carolina paddy also,
es.
the experimental crops received little atten-
eing appears to be almost unknown. But, in
, the soil was loosened, between the rows of
dough. The almost entire absence of tillage
n paddy plants were growing is, undoubtedly,
the results were unsatisfactory. But, tillage
on which the plants are growing in lines, and
a this Presidency.

Observations made during t growth of the crop and, at harvest.

20. The Carolina paddy generall
date of sowing. From many localities
mature at the same time, thus making
a difficulty; however, there are equall
plants did not shed their seed nearly
eties of paddy. Hence, if the harvest
ripening of the backward ears, there
the drawback experienced in the delay
deterioration of the straw, as is usua
generally agree, that the grain is alway
that crops raised from seed, matured ten
plants, the produce of seed sown at the

Transplanted crops longer in reaching maturity than sown crops.

check in growth
planted. Excep
but little percep
and from transplanted seedlings, when

21. The Carolina paddy plants
have been unusually unfortunate in a
&c. From one report the following i

"All at once, and this is the stra
by locusts which, while leaving unha
destroyed the Carolina paddy down t
It may be that the succulent robust
admit, afforded a more juicy stem,
culms of the country paddy.

ame into ear at from 10 to 12 weeks after the
omplaints were made that all the ears did not
e harvesting of the crop, in a satisfactory way,
s many reports in which it is stated that the
readily as do plants of the indigenous vari-
g was delayed, in order to allow time for the
as no loss from the shedding of the seed, and,
f the harvesting operations, is not felt in any
with country paddy, for the Experimenters
ripe, long before the straw. It was observed
ays earlier than crops raised from transplanted
ame time. This result, was attributed to the
e plants usually suffered from on being trans-
g in the time in reaching maturity there was
le difference, in the crops produced from seed
rown under similar conditions.

many of the experimental plots appear to
acting such destructive foes as locusts, hares,
resting extract is taken:—
est part of my story, the Carolina was attacked
ed all the country paddy around, deliberately
he ground."
owth of this paddy, which all Experimenters
l therefore a more attractive food than the

22. The ears of the Carolina paddy were reported, in many instances, to be from one-third to one-half heavier than those of country paddy grown under similar conditions. The average number of grains in an ear varied from 150 to 200, while many plants had from 10 to 12 fertile ears. One Reporter wrote:—

Ears of Carolina paddy heavy.

"I plucked indiscriminately a quantity of three kinds of paddy that were growing side by side. The following is the average number of grains on a single stalk of each:—Carolina 210 grains, Car paddy 101 grains, Sembalay 94 grains. I also observed that the Carolina grains stick very closely to the ears."

The Collector of Cuddapah, reported as follows:—

"I was present at the time of reaping and was surprised to see that the outturn was double that obtained from an equal extent of similar land cropped with country paddy. The stalks stood erect, were stronger and thicker, and obtained the uncommon height of from 4 to 5 feet."

The Produce.

23. Many of the Experimenters, noticed the difficulty that was experienced in separating the grain in threshing. One wrote;—

Difficulty of separating the grain in threshing.

"When the sheaves were threshed it took 8 or 9 strokes to shake off the grain, whereas for the ordinary country paddy I am informed four strokes suffice."

The reports agree generally, as to the uniform size of the grain and, its freedom from the thin shrivelled grain which, in samples of country paddy forms such a considerable percentage.

24. The threshing was usually performed by striking the sheaves on a log of wood, the way in which country paddy is threshed. The difficulty with which the grain is separated, is not a fault, as some suppose. It is certainly true, that more labor must be expended in threshing Carolina than country paddy, the grain of the latter separates so easily, *too easily for the Ryot's interests*, for, even with the greatest care, a considerable quantity of its grain is always shed in the field during the harvesting operations. Carolina paddy, is not more difficult to thresh than other cereals; it is certainly much more easily threshed than oats or barley.

25. Regarding the quality of the straw opinions varied greatly;—

Quality of the straw.

"The straw was for the most part strong and well grown, thicker, and stouter than the straw of indigenous varieties of paddy and the Ryots themselves say that it would be more valuable as fodder for cattle."

"On some of the experimental plots the straw was of an extraordinary length."

"The straw is undoubtedly coarser and the cattle do not eat it so freely as the straw of the ordinary country paddy."

On this subject the Collector of Coimbatore wrote;—

"While appreciating the larger yield of grain the Ryots take objection to the quality of the Carolina paddy straw. They said that the cattle would not eat it, and certainly my cattle refused it, but this, I think, was in consequence of its having been rather musty."

It is unlikely that cattle, that so readily eat the hard reedy straw of Cholum and Cumboo, will refuse the straw of Carolina paddy, when it is in a fresh state. When the cattle have refused it, the probability is, that the straw was, as noticed in the preceding extract, musty and unpalatable. Regarding the strength of the straw, the Superintendent of Government Farms, in reviewing some report on the cultivation of Carolina paddy, wrote;—

The strength of the straw of Carolina Paddy is an advantage.

"The strength of the straw objected to by some Ryots is a valuable characteristic of the Carolina paddy plant; it enables the crop to withstand the effects of rough weather. Storms which would prostrate crops of country paddy pass over crops of Carolina paddy harmlessly."

26. The yield of grain and of straw, from the Carolina paddy experimental plots, varied greatly, as the following statement shows —

RESULT OF CAROLINA PADDY EXPERIMENTS MADE IN THE MADRAS PRESIDENCY.

Number of Experiment.	Taluq or Village	Area.	Seed sown.		Date of Sowing.	Date of Reaping.	Yield per Plot.				Yield per Acre.		
							Grain threshed.		Straw.		Grain threshed.		Straw.
			Weight.	Measure.			Weight.	Measure.	Weight.	Length of Straw.	Weight.	Measure.	Weight.
		SQ. YDS.	LBS.	MADRAS MEASURES.*			LBS.	MADRAS MEASURES.*	LBS.	FEET.	LBS.	MADRAS MEASURES.*	LBS.
	SOUTH ARCOT DISTRICT.												
	Trickalore Taluq.												
3	Trickalore	22,400	270	..	5th September ..	..	11,564	..	18,540	4½	2,499	..	4,006
4	Do.	6,000	73	..	18th October ..	24th do. ..		..	1,120				
5	Do.	6,400	62	..	14th September ..	1st do. ..	1,089	..	2,000	2½	824	..	1,512
6	Do.	1,600	26	..	14th do. ..	8th do. ..	220	..	500	2½	665	..	1,512
	CHINGLEPUT DISTRICT.												
	Sydapet Taluq.												
7	Sydapet	980	10	5	22nd September ..	10th January ..	358	168	1,092	4	1,768	830	5,393
8	Do.	1,113	30	..	21st December ..	16th April ..	290	..	804	..	1,261	..	3,496
	Chingleput Taluq.												
9	Nattam	1,867	..	5	3rd September ..	7th January ..	528	200	..	..	1,368	518	..
10	Do.	1,600	..	6	14th do. ..	20th do. ..	254	96	..	..	768	290	..
11	Melmayur	800	10	4	24th September ..	6th February ..	167	60	..	..	949	..	..
	Madranticum Taluq.												
12	Madranticum	2,667	..	5	19th November ..	28th March ..	491	186	..	..	891	338	..
13	Penayur	2,400	10	4	31st December ..	3rd May ..	315	120	..	..	635	..	..
	Trivellore Taluq.												
14	Nagalapuram ..	720	12	..	1st October ..	..	156	..	337	2½	1,050	..	2,269
15	Palavacum	800	25	..	11th August ..	8th January ..	125	..	..	3	756	..	..
	NORTH ARCOT DISTRICT.												
	Chittoor Taluq.												
16	Chittoor	1,600	17	6	..	19th March ..	690	240	..	..	2,087	..	..
17	Do.	3,200	25	9	..	9th April ..	991	345	..	..	1,499	..	..
18	Do.	800	12	..	7th July ..	12th November ..	246	..	..	..	1,488	..	..
	Vellore Taluq.												
19	Agram	267	..	6	1st September ..	25th February ..	108	..	..	..	1,957	..	..
	Arcot Taluq.												
20	Visharam	1,067	..	8	..	..	356	199	..	..	1,615	..	..
	MADRAS DISTRICT.												
21	Madras	2,700	61	..	19th September ..	20th January ..	300	..	710	..	538	..	1,278
	NELLORE DISTRICT.												
	Rapur Taluq.												
22	Rapur	532	17	..	15th October ..	29th February ..	178	..	600	3	1,619	..	5,458
23	Do.	774	17	..	Do. ..	Do. ..	105	..	360	3	657	..	2,251
	Polur Division.												
24	Naidupett	391	10	..	17th September ..	16th January ..	79	..	..	3¼	988	..	..
25	Agraharapett	7,259	127	..	20th do. ..	22nd do. ..	1,223	..	..	3	815	..	..
26	Do.	2,961	42	..	20th do. ..	27th do. ..	260	..	..	3	426	..	..
27	Vinnamala	890	13	..	20th August ..	2nd January ..	75	..	..	3¾	410	..	..

* 104 Cubic Inches, or, 0168 of an Imperial Bushel.

EXPERIMENTS MADE IN THE MADRAS PRESIDENCY.

THE CAROLINA PADDY,

RESULT OF CAROLINA PADDY EXPERIMENTS MADE IN THE MADRAS PRESIDENCY.—(*Continued*).

Number of Experiment.	Name of Village.	Area.	Seed sown.		Date of Sowing.	Date of Reaping.	Yield per Acre.					
			Weight.	Measure.			Grain threshed.		Straw.		Grain threshed.	Straw.
							Weight.	Measure.	Weight.	Length of Straw.	Weight.	Measure.	Weight.
							LBS.	MADRAS MEASURE.	LBS.	FEET.	LBS.	MADRAS MEASURE.	LBS.
		SQ. YDS.	LBS.	MADRAS MEASURE.									
	NELLORE DISTRICT—(*Continued*).												
	Venkatagherry Division.												
28	Mewalcoor	1,504	34	..	3rd November ..	23rd March ..	231	..	425	..	1,365	..	1,367
	Nellore Taluq.												
29	Kavali	1,452	11	..	1st September ..	30th December ..	180	..	..	3	600	..	..
	Nellore Taluq.												
30	Nellore	5,857	76	..	11th do. ..	23rd January ..	672	..	1,440	2	555	..	1,189
	KISTNA DISTRICT.												
	Bezwada Taluq.												
31	Velangleru	284	28	..	1st August ..	26th December ..	160	..	..	3	2,256	..	..
32	Vanavarum	1,806	14	..	9th do. ..	December ..	480	..	..	..	1,779	..	..
33	Do.	1,307	10	..	7th September ..	January ..	360	..	..	..	1,333	..	..
34	Kumkipad	2,130	16	..	6th and 7th August	December ..	442	..	..	..	1,004	..	..
35	Do.	2,130	12	..	7th September ..	Do. ..	332	..	..	..	755	..	..
	Nandigama Taluq.												
36	Annumchepalli ..	387	22	..	July	1st January ..	168	..	..	..	2,101	..	..
37	Do.	726	22	..	Do.	Do.	168	..	..	..	1,120	..	..
38	Jaggiapett	1,113	18	..	Do.	Do.	354	..	..	..	1,339	..	..
39	Tanguenchoprole ..	1,113	57	..	August	November ..	318	..	..	..	1,383	..	..
	VIZAGAPATAM DISTRICT.												
	Palconda Taluq.												
1	55 Vadamah	4,000	180	..	21st July	17th November ..	1,202	..	2,500	24	1,462	..	3,025
	56 Palcondah	..	60	..	..	..	563	..	..	..	..	..	..
	Do.	1,210	16	..	*Do.*	*Do.*	242	..	..	..	970	..	..
	Bapatla Taluq.												
40	Do. ..	1,210	16	..	*Do.*	*Do.*	242	..	..	..	970	..	..
	Bapatla Taluq.												
41	Gunnur Peta Mangalagiri	2,560	30	..	1st September ..	30th December ..	1,206	..	2,904	3	1,773	..	4,350
42	Chebrolu	2,400	21	..	20th July	21st November ..	560	..	700	3	726	..	1,411
43	Do.	2,394	21	..	Do.	Do.	277	..	692	3	618	..	1,291
44	Mantripody	9,680	112	..	.. ..	.. ..	960	..	..	..	480	..	..
	Repalle Taluq.												
45	Addepalli	552	16	..	12th August ..	28th December ..	160	..	230	24	1,365	..	2,093
46	Bantupelu	1,216	84	..	.. ..	.. ..	240	..	..	..	720	..	..
47	Chandarole	2,420	50	..	.. ..	.. ..	..	..	..	..	480	..	..
	Palond Taluq.												
48	Pinnali	2,420	60	..	.. ..	.. ..	520	..	..	..	1,040	..	..
	Vallur Zemindary.												
49	Boddapud	3,775	72	..	.. ..	.. ..	480	..	..	..	613	..	..
	GODAVARY DISTRICT.												
	Kaikaram Taluq.												
50	Ragunadevapuram ..	6,788	40	..	13th July	13th November ..	1,610	..	..	4½	1,189	..	..
51	China Kondepudy ..	10,264	48	..	3rd do.	15th do. ..	1,610	..	..	4	773	..	..
52	Sirkayalapalli	4,441	40	..	1st do.	2nd December ..	610	..	..	3	897	..	..
	Tanuku Taluq.												
53	Tanuku	9,680	50	..	1st do.	20th November ..	1,560	..	..	4½	760	..	..
	Yernagudem Taluq.												
54	Chagallu	1,210	12	..	11th do.	24th do. ..	156	..	620	..	624	..	2,600

RESULT OF CAROLINA PADDY EXPERIMENTS MADE IN THE MADRAS PRESIDENCY.

Number of Experiment.	Taluq or Village.	Area.	Seed sown.		Date of Sowing.	Date of Planting.	Yield per Acre.			
			Weight.	Measure.			Grain Threshed.		Straw.	
							Weight.	Measure.	Weight.	Measure.
		Sq. yds.	Lbs.	Madras Measure.			Lbs.	Madras Measure.	Lbs.	Madras Measure.
	Vizagapatam District—(Concluded.)									
	Vizianagram Zemindary.									
	Gajam District.									
	Aske Taluq.									
59	Aska				20th July	6th August				
60	Do.				4th July	9th November				
61	Do.				27th do.	4th December				
62	Do.				27th do.	Do.				
	Kurtoor District.									
	Kavilanta Taluq.									
63	Boyalatadiparti	726	17		17th July	12th August			4,063	
64	Vuppalur	2,480	85		18th August	Do.			2,329	
65	Timmanayanipetlah	1,210	66		6th do.	Do.			2,128	
66	Tollamudipu	2,541	78		29th do.	Do.			1,874	
67	Hanumapagudum	1,161	17		8th do.	Do.			1,465	
68	Timmanayanipetlah	1,391	54		26th do.	Do.			1,294	
69	Owk	2,057	54		14th September	5th January			1,200	
	Nundial Taluq.									
70	Nundial	726	51		10th August	2nd January			2,160	

EXPERIMENTS MADE IN THE MADRAS PRESIDENCY.

71	Do.	3,509	125	28th July	28th November	1,276	4,320		1,761			
72	Do.	1,210	28	18th do.	3rd December	376			1,605			
73	Do.	1,597	47	5th August	5th do.	456			1,382			
74	Do.	1,210	28	12th do.	29th November	342			1,868			
75	Do.	1,597	35	26th July	26th do.	380	528		1,152			
76	Do.	387	10	5th August	20th December	61			772			
	Nandidrug Taluq.											
77	Bizinivemula	968	22	13th August	26th December	446			2,283			
78	Nandikotkur	726	17	12th do.	31st do.	247			1,647			
79	Bizinivemula	2,226	35	18th do.	26th do.	674		3	1,467			
80	Tamagatla	968	16	5th do.	15th do.	216	1,500	3	1,080			
81	Yaddanapalli	5,387	92	27th do.	25th do.	1,160			1,052			
82	Do.	1,452	16	18th do.	26th do.	266			887			
	Pattiseemla Taluq.											
83	Bondimadugula	242	14	20th July	26th December	141		4	2,835			
84	Jilladuduchala	1,210	48	6th August	4th January	480		4	1,920			
85	Kotakonda	968	24	20th do.	19th do.	240		4	1,200			
86	Karivemula	4,477	120	5th September	4th February	912			986			
	Ramachandrapuram Zemindary.											
87	Yeldurty	1,210	30	2nd August	4th December	513			2,052			
88	Do.	1,815	35	3rd October		622			1,659			
89	Vudumalpad	4,840	77	9th August	5th December	885		3	885			
90	Sudapalli	9,680	135	2nd September		1,230			615			
	Streeli Taluq.											
91	Chagalmarry	484	18	14th August	28th December	266	312		2,660			
92	Do.	1,597	11	2nd do.		648			1,965			
93	Do.	2,613	38	15th do.	28th December	484			897			
	Marlapur Taluq.											
94	Chaplamadugu	12	12	12th August	10th January	64						
95	Yeragoodapallem	6	6	12th do.	3rd do.	78						
96	Tripurantakum			12th do.	10th do.	72						
97	Kowlacoontla		6	12th do.	10th do.	86						

8.3.37

Number of Experiment	Taluq or Village.	Area.	Seed sown.		Date of Sowing.	Date of Reaping.	Yield per Plot.				Yield per Acre.		
							Grain Unrubbed.		Straw.		Grain threshed.		Straw.
			Weight.	Measure.			Weight.	Measure.	Weight.	Length of Straw.	Weight.	Measure.	Weight.
		SQ. YDS.	LBS.	MADRAS MEASURES.			LBS.	MADRAS MEASURES.	LBS.	FEET.	LBS.	MADRAS MEASURES.	LBS.
							KURNOOL DISTRICT—(*Continued*).						
	Cumbum Taluq.												
98	Yerrabollem		26	..	8th September ..	10th February ..	178	..	..	..	..	..	..
						BELLARY DISTRICT.							
	Hospett Taluq.												
99	Mudulapuram	1,540	28	..	2nd August ..	1st January ..	570	..	1,293	6	1,791	..	4,066
100	Hossoor	242	14	..	20th July ..	10th December ..	80	..	..	4	1,600	..	..
101	Hullirampuram ..	302	12	..	10th June ..	30th November ..	80	..	..	4	1,282	..	..
102	Kamalapoor	14,520	160	..	14th August ..	25th December ..	3,162	..	..	3	1,054	..	..
103	Do.	..	14	..	20th do. ..	28th January ..	242	..	324	3	..	..	..
104	Chitwadgi	514	12	..	5th July ..	25th November ..	110	..	..	3	1,936	..	..
105	Basapuram	605	12	..	1st August ..	30th do. ..	80	..	120	3	640	..	960
	Anantapur Taluq.												
106	Singanamulla	1,815	42	..	4th August ..	6th January ..	1,033	..	..	4½	2,755	..	..
107	Do.	1,815	42	..	4th do. ..	10th do. ..	944	..	..	3¾	2,519	..	..
108	Bookarungasamudrum.	3,630	36	..	22nd do. ..	20th December ..	820	..	..	3	1,093	..	..
109	Anantapur	605	16	..	22nd September ..	4th February ..	131	..	..	3	1,049	..	..
	Bellary Taluq.												
110	Moka	3,388	19	..	23rd August ..	12th January ..	280	..	..	2½	400	..	..
	Huvinhadgally Taluq.												
111	Bombarahully	31	..	..	23rd August ..	14th December ..	508	..	500	3	..	..	..
							CUDDAPAH DISTRICT.						
	Madanapelly Taluq.												
112	Kollapalli	3,630	92	..	17th January ..	23rd May ..	1,794	..	..	5	2,392	..	..
113	Do.	3,630	92	..	5th do. ..	18th do. ..	1,776	..	..	5	2,368	..	..
114	Do.	1,694	43	..	5th do. ..	16th June ..	388	..	..	5	1,109	..	..
	Cuddapah Taluq.												
115	Cuddapah	5,445	90	..	26th September ..	30th January ..	1,187	..	..	..	1,055	..	..
116	Do.	13,373	261	..	..	..	2,802	..	..	..	1,014	..	..
							MALABAR DISTRICT.						
	Polghaut Taluq.												
117	Akatetara	225	12	..	22nd May ..	20th October ..	148	..	..	..	3,184	..	..
118	Koppam	1,600	50	..	25th June ..	..	740	..	..	..	2,238	..	..
119	Aktethara	2,200	90	..	5th May ..	25th September ..	900	..	..	..	1,980	..	..
120	Do.	596	26	..	15th do. ..	18th October ..	227	..	..	3	1,847	..	..
121	Kattuseri	360	10	..	20th do. ..	20th October ..	54	..	150	4½	871	..	2,420
122	Puduchary	1,100	21	..	27th June ..	9th November ..	133	..	..	3	585	..	..
	Cherakol Taluq.												
123	Puyadi	698	16	..	..	20th October ..	255	..	..	3½	1,768	..	..
124	Kuttoor	1,800	45	..	28th May ..	28th do. ..	540	..	..	3	1,452	..	..
125	Kalliad Amshom ..	2,640	51	..	16th May ..	4th do. ..	768	..	..	5	1,409	..	..
126	Kalliad	3,324	46	..	22nd May ..	15th do. ..	599	..	..	5	873	..	..
127	Do.	2,300	44	..	17th do. ..	5th do. ..	224	..	..	..	433	..	..
	Kottayam Taluq.												
128	Perinkolam	560	16	..	8th June ..	7th do. ..	113	..	85	4	983	..	..
129	Do.	1,464	42	..	18th May ..	10th do. ..	240	..	..	5	793	..	..
	Wynaad Taluq.												
130	Ellornad	188	10	..	10th June ..	28th November ..	95	..	114	2	2,446	..	2,935

RESULT OF CAROLINA PADDY EXPERIMENTS MADE IN THE MADRAS PRESIDENCY—(*Continued*).

Number of Experiment.	Taluq or Village.	Area.	Seed Sown.		Date of Sowing.	Date of Reaping.	Yield per Plot.				Yield per Acre.		
							Grain threshed.		Straw.		Grain threshed.		Straw.
			Weight.	Measure.			Weight.	Measure.	Weight.	Length of Straw.	Weight.	Measure.	Weight.
		SQ. YDS.	LBS.	MADRAS MEASURES.			LBS.	MADRAS MEASURES.	LBS.	FEET.	LBS.	MADRAS MEASURES.	LBS.
						MALABAR DISTRICT—(*Continued*).							
	Ponany Taluq.												
131	Ishwaramangalam ..	1,360	10	..	18th April ..	10th September ..	291	..	494	3	1,036	..	1,759
						SOUTH CANARA DISTRICT.							
	Kasargod Taluq.												
132	Kallivar village in Nileshwar Mogni ..	2,420	16	..	20th June ..	17th October ..	624	..	1,248	3½	1,248	..	2,497
133	Kottur village in Kavenad Mogni ..	2,420	15	..	24th do. ..	20th do. ..	624	..	1,248	4	1,248	..	2,496
134	Kodoth village in Paduvannad Mogni ..	3,388	32	..	18th June ..	16th do. ..	528	..	1,056	4	754	..	1,509
	Uppinangadi Taluq.												
135	Kadikar village ..	993	15	..	17th June ..	20th October ..	287	..	..	2	1,399	..	..
136	Do. ..	859	14	..	Do. ..	28th do. ..	106	..	..	2	597	..	..
	Udipi Taluq.												
137	Mudindambur village, Nidambur Magane ..	950	16	..	12th May ..	9th October ..	320	..	680	5	1,630	..	3,464
	Mangalore Taluq.												
138	Codiyalbail	3,267	99	..	20th & 24th June.	15th October ..	504	..	..	3	747	..	..

						COIMBATORE DISTRICT.							
	Coimbatore Taluq.												
139	Coimbatore	960	28	..	4th July ..	..	769	..	500	2	3,877	..	2,521
140	Oodanthoray	2,280	120	..	14th August ..	26th December ..	1,308	..	866	4	2,776	..	..
141	Coimbatore	600	12	..	5th September ..	22nd January ..	287	..	400	5	2,319	..	3,227
142	Do.	600	25	..	29th August ..	22nd do. ..	262	..	..	5	2,117	..	..
143	Do.	600	25	..	Do. ..	22nd do. ..	192	..	300	3½	1,553	..	2,420
144	Do.	600	12	..	5th September ..	22nd do. ..	167	..	250	3¾	1,351	..	2,017
145	Do.	1,920	75	..	8th August ..	21st do. ..	525	..	937	2½	1,323	..	2,362
146	Chittarachavady ..	1,280	23	..	28th June ..	30th October ..	258	..	625	3	976	..	2,363
147	Odantheray	4,000	78	..	23rd August ..	26th December ..	450	..	..	3	544	..	..
	Darapuram Taluq.												
148	Darapuram	100	13	..	7th July ..	..	67	..	..	3	3,243	..	..
149	Do.	400	23	..	31st do. ..	22nd November ..	194	..	..	3	2,347	..	..
150	Do.	400	11	..	15th September ..	14th January ..	172	..	..	..	2,081	..	..
151	Do.	700	33	..	14th June ..	24th October ..	253	..	..	3	1,749	..	..
152	Do.	400	13	..	27th November ..	4th April ..	108	..	..	2	1,307	..	..
153	Do.	400	13	..	7th August ..	..	97	..	..	3	1,174	..	..
154	Do.	600	16	..	5th July	..	140	..	..	3	1,129	..	..
155	Do.	700	27	..	18th June ..	27th October ..	162	..	..	3	1,120	..	..
156	Do.	400	13	..	16th July	8th Novem ..	81	..	..	3	980	..	..
	Pollachy Taluq.												
157	Marchinaigompolliem.	387	12	..	1st June ..	9th December ..	350	..	125	3	4,377	..	..
158	Anamallay	2,129	50	..	3rd May ..	..	1,500	..	..	3¾	3,410	..	..
159	Do.	532	20	..	20th July ..	27th December ..	300	..	200	3	2,729	..	..
160	Sunthagoundenpolliem.	3,193	100	..	15th do.	1st November ..	1,650	..	1,500	3	2,501	..	..
161	Do. ..	532	12	..	15th August ..	1st December ..	250	..	150	3	2,274	..	1,365
162	Marchinaigompolliem..	581	10	..	2nd January ..	9th May	235	..	150	3	1,958	..	..
	Sathiamungalum Taluq.												
163	Vaniputtur	1,600	20	..	2nd September ..	26th January ..	512	..	570	4½	1,549	..	..
164	Poodooparyur ..	1,600	20	..	18th do. ..	2nd February ..	396	..	494	4½	1,198	..	..
165	Vaniputtur	600	15	..	29th do. ..	February ..	96	..	150	2½	774	..	1,210
166	Puliyampattykarai ..	400	10	..	3rd October ..	10th February ..	64	..	100	2½	774	..	1,210

RESULT OF CAROLINA PADDY EXPERIMENTS MADE IN THE MADRAS PRESIDENCY—(*Continued*).

Number of Experiment.	Taluq or Village.	Area.	Seed Sown.		Date of Sowing.	Date of Reaping.	Yield per Plot.				Yield per Acre.		
							Grain threshed.		Straw.		Grain threshed.		Straw.
			Weight.	Measure.			Weight.	Measure.	Weight.	Length of Straw.	Weight.	Measure.	Weight.
		SQ. YDS.	LBS.	MADRAS MEASURES.			LBS.	MADRAS MEASURES.	LBS.	FEET.	LBS.	MADRAS MEASURES.	LBS.
	COIMBATORE DISTRICT—(*Continued*).												
	Oodumalapetta Taluq.												
167	[illegible] ..					8th December ..	2,862	..	..	3	1,574	..	..
[illegible]	[illegible]	[illegible]				1 Decr							
169	Valayapalayam ..	605	12	..	5th December ..	20th May ..	114	..					
	Perindoray Taluq.												
170	Nunjakalambady ..	320	21	..	4th October ..	1st March ..	288	..	..	3½	4,356	..	..
171	Dalavoypolliem ..	448	12	..	1st do. ..	4th February ..	330	..	600	4½	3,565	..	..
	Caroor Taluq.												
172	Nerocr	1,600	27	..	18th November ..	28th April ..	216	..	393	3	653	..	1,189
	SALEM DISTRICT.												
	Trichengode Taluq.												
173	Coondelputty	968	12	..	Early part of July.	..	768	..	1,500	4½	3,840	..	7,500
174	Mattooputty	3,630	24	..	Early part of Aug.	..	1,843	..	3,750	4½	2,458	..	5,000
175	Comaramangalam ..	2,120	19	..	Early part of July.	..	230	..	460	3½	526	..	1,027
	Namkal Taluq.												
176	Mothalaiputty	1,210	24	..	1st October ..	20th January ..	405	..	..	4½	1,620	..	..
177	Kosavamputty	1,210	24	..	10th do. ..	10th February ..	337	..	..	5	1,350	..	..
178	Do.	605	18	..	5th do. ..	February ..	135	..	..	5	1,080	..	..

	TANJORE DISTRICT.												
	Tanjore Taluq.												
179	Nadukávéri	3,200	120	..	10th June ..	22nd October ..	1,995	..	..	..	3,077	..	..
180	Kullimáttur	2,160	80	..	11th do. ..	21st do. ..	1,250	..	..	..	2,801	..	..
181	Tiruppayanam ..	2,080	78	..	15th do. ..	26th do. ..	986	..	..	..	2,295	..	..
182	Daiyastanam Tinga-loor.	480	26	..	1st do. ..	30th do. ..	151	..	..	..	1,323	..	..
183	Mokasakarkudi ..	5,920	161	..	26th June ..	30th October ..	1,852	..	..	..	1,514	..	..
184	Kadugeli	3,200	75	..	25th August ..	30th December ..	700	..	..	..	1,059	..	..
185	Venentasasamudram ..	2,080	60	..	22nd June ..	29th October ..	420	..	..	..	977	..	..
186	Vaurankudi	1,570	56	..	20th July ..	12th December ..	309	..	..	..	953	..	..
187	Perumpuliyar ..	2,420	57	..	1st October ..	26th January ..	237	..	..	..	474	..	..
	Combaconum Taluq.												
188	Palaiyarukai	4,800	196	..	22nd June ..	25th October ..	2,205	..	..	..	2,223	..	..
189	Perumpadi	2,240	111	..	20th July ..	5th December ..	913	..	..	..	1,975	..	..
190	Sembangudi	1,600	111	..	3rd do. ..	12th November ..	650	..	..	..	1,966	..	..
191	Ranganathapuram ..	2,016	78	..	22nd June ..	15th November ..	748	..	..	..	1,796	..	..
192	Nermelikudi	4,000	157	..	20th June ..	6th October ..	1,024	..	..	..	1,239	..	..
193	Veppattur	3,200	78	..	23rd July ..	19th December ..	406	..	..	..	615	..	..
	Mannargudi Taluq.												
194	Mannargudi	822	[illegible]	[illegible]	..	..	492	200	..	..	2,897	1,178	..
	Trivadi Taluq.												
195	Trivadi	1,200	50	20	12th June ..	1st October ..	608	247	..	..	2,452	996	..
	TRICHINOPOLY DISTRICT.												
	Perambalur Taluq.												
196	Perambalur	242	12	4	9th September ..	6th February ..	150	..	..	..	3,000	..	..
	Woodiarpolliam Taluq.												
197	Arealúr	4,840	58	..	15th July ..	7th December ..	1,360	..	..	3½	1,360	..	..

RESULT OF CAROLINA PADDY EXPERIMENTS MADE IN THE MADRAS PRESIDENCY—(*Continued*).

Number of Experiment.	Taluq or Village.	Area.	Seed Sown.		Date of Sowing.	Date of Reaping.	Yield per Plot.				Yield per Acre.			
			Weight.	Measure.			Grain threshed.		Straw.		Grain threshed.		Straw.	
							Weight.	Measure.	Weight.	Length of Straw.	Weight.	Measure.	Weight.	
		SQ. YDS.	LBS.	MADRAS MEASURES.			LBS.	MADRAS MEASURES.	LBS.	FEET.	LBS.	MADRAS MEASURES.	LBS.	
	Trichinopoly Taluq.													
198	Kochur	4,840					1,224	..	..	..	1,224	..	..	
	Musiry Taluq.													
199	Musiry	1,694	33	..	19th August	2nd January	171	..	400	2¼	489	..	1,143	
	MADURA DISTRICT.													
	Paluey Taluq.													
200	Paluey	355	46	..	6th October	21st March	..	..	..	3	3,149	..	..	
201	Erempully	355	27	10	5th October	2nd February	231	..	..	..	2,004	..	..	
202	Thamaraiyolum ..	711	27	10	11th September	29th January	146	..	..	..	2,001	..	..	
							293	..	..	..				
	Dindigul Taluq.													
203	Baldistnapuram ..	968	30	..	4th September	20th do.	..	..	..	..	..	..	..	
204	Sellapady	1,111	12	..	10th do.	10th February	567	..	1,618	3¾	2,840	..	8,107	
205	Baldistnapuram ..	4,840	36	..	25th do.	1st do.	540	..	..	4	2,352	..	..	
							1,320	..	440	4	1,320	..	..	
	Madura Taluq.													
206	Kolamungalum ..	622	16	6	4th October	25th do.	95	..	..	..	740	..	..	

27. The foregoing statement, includes only the results of experiments that appeared to have been conducted under fair average conditions, and were on a scale sufficiently extensive to afford data of practical value. The difference in the results tabulated, must be attributed to the varying conditions of soil, irrigation, and tillage, under which they were obtained, and not, to any appreciable extent, to the climate or one part of the Presidency being more suited, than that of another part, for the growth of this variety of paddy. Though, there is a wide difference between the climate of South Carolina and, the climate of the Madras Presidency, this difference, does not appear to have influenced the growth of the paddy in this country, the results from acclimatized and, imported seed, having differed but little. Throughout the wide range of country over which the experiments were spread the yield, almost everywhere, was satisfactory when the proper conditions of soil and tillage were met with. The yield of grain per acre was, in several instances, higher than the average yield of an acre in South Carolina. It is true, that in the majority of the experiments the yield was unsatisfactory, but this applies equally to the country paddy crops reported on.

Over the country generally more poor crops than good crops.

The fact is, throughout the country, there are a much greater number of indifferent crops produced, than of good crops. It is only when the individual history of each crop is searched out and recorded, as was done in the case of most of the Carolina paddy experimental crops, that the fact, that there are so many bad crops raised, is brought into prominence. The following extract from a report by the Collector of Cuddapah, affords information on this question :—

"The abundance of produce was, of course, proportionate to the fertility of the soil; in regard to the little success that attended the efforts of a few Ryots in some localities, I have only to observe that it was owin to the sterility of the soil or to the crops having been destroyed by blight."

Yield good in several instances.

28. In some instances the general results of the experiments were very satisfactory thus ;—

"The outturn exceeded by one-third the aver e yield of the adjoining land under indigenous paddy."

"The yield he describes as treble that of the o ary paddy, while the straw is half as high again."

The Collector of Malabar remarked :—

"Marked success attended the experiments in veral instances ; the failures in a few, and want of success in others, is attributable accidents, to which all crops are liable, as too much or, too little rain, attacks of in s, &c."

The Collector of North Arcot wrote :—

"The result of the experiment I consider to most satisfactory and proves that the Carolina paddy is a cereal well suited to thi country which thrives splendidly without requiring more skill or care in the cultiv n than the commonest grain."

The Dewan of the Travancore State wrote :—

"From the result of the experiment we may think, safely conclude that the soil of Travancore especially in the Northern Districts well adapted to the growth of the new species of paddy, the grains of which are decidedly superior in quality to the common produce of the country."

Quality of the rice.

29. There is a considerable difference, in the opinions expressed regarding the quality of the rice, of the Carolina paddy, raised in the experiments. Before proceeding to notice these opinions, it is as well to observe, that in the Madras Presidency nearly the whole of the rice, for local consumption and export, is prepared by the pe e and mortar, worked by women ; no machinery being used. The common practice, is to boil the paddy and, after the interval of a day or two, during which it is dried by exposure to the sun, to subject it to the husking operations. A considerable quantity of paddy is, however, husked without being boiled. The process of husking is very rude and tedious, and the rice has a very poor appearance, compared with that of rice prepared in rice mills. Imperfect though the process is, it is cheaper, than that by which rice is prepared in mills

in America. It is only in appearance, that the rice fails; for, this apparen
an advantage from the consumer's point of view, for, in the effort to render
agreeable to the eye, the milling process removes from the rice some
nutritious portions, those in which the albuminoids are chiefly to be found.

30. The following extract, from an Annual Report of the Superint
Government Farms refers to two samples of rice, forwarded to England for v
being the produce of Carolina paddy produced on the Sydapet Experimental F

"89. Parcel A was prepared from 8 Madras measures of Carolina pad
consisted of $3\frac{3}{4}$ Madras measures of clean rice. Messrs. Walker and Co. wer
enough to have the paddy husked in the way that it is usual, in Madras, t
all paddy, intended for export to England. The 8 measures of paddy, yie
follows:—

	By volume. Per cent.
Clean rice fit for the Home market	46·87
Broken rice	3·13
Husk and wastage	50·00
Total	100·00

"With reference to this result, Messrs. Walker and Co. wrote to me:—'
not very well satisfied as to the res lt of the husking; the grains are more brok
is desirable, but the coolies say the und it more difficult to husk the paddy t
ordinary native grain.' With re ice to the cost of husking, they wrote:
cost of husking the 8 measures is na, and we can contract at this rate for
intend sending to England. In t me letter they remarked: 'the wastage
8 measures may be taken as a fai rage.'

"90. Parcel B consisted 3 pounds of cleaned rice prepared fro
Madras* measures of country-ra Carolina paddy. In addition to the cle
there were $24\frac{3}{4}$ measures of brok ce, the value of which was, in Madras, o
per measure.

"91. The following letter r to parcel B:—

'Dear Sir,—We now wait ou with our broker's report and valuatio
four bags of rice sent to London ur account by S.S. *Sultan*, and we trust t
will be considered satisfactory. may mention that while your rice is v
10*s.* $4\frac{1}{4}$*d.* to 10*s.* 6*d.* per cwt., *or* y Pinky was sold at 9*s.* 6*d.* to 10*s.* $7\frac{1}{2}$*d.*

(Signed) WALKER AN

'*Broker's report on four b* G.F. *of rice per "Sultan."*

W. & Co.

R.

'The rice proves to be very white grain, and in quantity would c
10*s.* $4\frac{1}{4}$*d.* to 10*s.* 6*d.*; it is differ from what is known as Pinky, and we
the starch-makers, who are the largest consumers of this particular sort, would
so well, but for cleaning purposes it would meet a ready sale.'

"92. The rice was sold in London in the usual way; the price realized, 11*s.*
per cwt., was only a trifle higher than the price ruling at the time for ordinary Madra
rice. This result, was somewhat disappointing; judging from the value generally put
upon Carolina rice in London, I ha ticipated a much larger price than was obtained.

"93. It is, I think, probable that the very high price that Carolina rice imported
from America commands in England is due chiefly to the very superior way in which
it is prepared for market. The Madras-grown Carolina paddy, from which the rice
(Parcel B) was prepared, was, as far as I can judge, quite equal in quality to the

* 104 cubic inches.

Carolina paddy which was imported into this country from America and which, was the seed from which the paddy in question was raised. In Madras, the husk merely is removed, there is no attempt to remove the dark-colored surface which is found immediately beneath, and very little is attempted in the way of sizing the grain, the whole process, such as it is, being performed by women by means of a pestle and mortar and a bamboo sieve."

31. Dr. Thompson, who made some interesting experiments in Chingleput and in Tinnevelly with Carolina paddy, gives the yield of rice, he obtained from Carolina paddy and two indigenous varieties of paddy as follows:—

—	Weight per Madras Measure.	Weight of Rice obtained.
	oz.	oz.
Manawari Sumba paddy ..	42·50	32
Car paddy	42·25	32
Carolina paddy	43·50	32·50

32. As regard the estimation in which the Carolina rice is held by Natives, the following extracts will afford information;—

"I gave some of the paddy to Brahmins, and they informed me that there is less loss in removing the husk than in the ordinary paddy and that it is far superior as an article of food."

"The rice is far superior in color, size, and flavour to any of the country kinds that can be produced within the same short time;

"that the Carolina rice is superior to the bes of the rice staples of the country is not now denied;"

"the rice of Carolina paddy is decidedly mu h superior to that of the ordinary paddy;"

"it is perfectly white in color and when di sed for food is of good taste. In quality it is equal, if not superior, to Peshanam p dy grown in the neighbourhood of Nellore and which is considered to be the best pa y in this district;"

"the quality of the rice is equal to that of ordinary kind, but not equal to Siroomony and other superior kinds;"

"the grain is larger and coarser than that us by well-to-do people. The grain is however less liable to break in husking than tha ordinary paddy;"

"the rice produced is larger, more translucc and altogether nicer-looking than the Manawari Sumba and weighs $1\frac{1}{2}$ oz., to the m ure heavier."

"The Carolina rice, though a large grain, is ite, a quality which no other kind of paddy possesses; its taste when boiled is no uferior in flavour to Sumba and Mellaghi."

33. From these extracts, and others that mig be given, there can be no doubt but that, the rice, prepared from the Carolina pad aised in this country, was really excellent, and superior to much of the rice produ in this country. The flavour of the rice, when cooked, will depend greatly upon character of the soil upon which the paddy was raised.

34. The London valuations, of the samples Carolina rice, from Madras-grown Carolina paddy, were certa y not encouraging, but, as was noticed in the extract give it is very probable that the low value put upon the rice was consequence of its unsatisfactory appearance, due to the imperfect way in which it prepared.

London valuation of Madras-grown Carolina rice not encouraging.

General opinions and observations arding the crop.

35. The Deputy Collector of Arcalur reporte periments I have already made

"Upon the whole I am satisfied, from the tw ltivation; like the country Car, that, Carolina requires no extraordinary care in it expense; and the profit, to the it can be easily grown without entailing any e Ryot, I have no doubt, would be much greater than what he would obtain from the country paddy."

The Acting Sub-Collector of Salem, in submitting his report, remarked:—

"I am convinced that the Carolina paddy is far more productive than any of the indigenous kinds, and that it is so has been shown by my first experiment."

The Acting Collector of Malabar wrote:—

"The experiments were, I think, pretty successful considering the ignorance of the individuals who made them with regard to the best mode of cultivation and the best soil adapted to the growth of the plant. All soils have been tested—common rice lands, garden land, and dry paremba lands. The seed was sown broadcast and in beds, and the plants were in some instances transplanted, and in others left in the beds in which they were first sown."

The Collector of Salem wrote:—

"The peculiarities which I observed in the Carolina crop are—

"1*st*.—That it grows and ripens much faster than the ordinary country kind.

"2*nd*.—That the stalks are thicker and better able to stand the weight of the ear than the country paddy; it contains a larger number of grains. The country paddy stalks being very thin they bend, and the consequence is that much of the grain is lost on the ground before the crop is cut."

The Deputy Collector of Naidupet wrote:—

"The Carolina paddy has this advantage over the Peshanum (the best paddy in the Nellore District), that it is a p[illegible] of only 4 months' growth, whereas the Peshanum requires fully 6 months to con[illegible] maturity, and it (Carolina paddy) would beyond doubt fetch as good a price in the [illegible]cket as the Peshanum owing to the superior quality of the rice."

The Agent of the Shivagunga Zer[illegible]ri wrote:—

"I do not hesitate to say [illegible] the Carolina paddy has the following advantages over the best descriptions o[illegible]ddy, viz., Mellaghi and Sumba, grown in this zemindari:—(1) It reaches matur[illegible]n 4½ months and like the Mellaghi and Sumba which are ripe for the sickle onl[illegible]ter the lapse of 6 months; (2) the outturn of Carolina paddy is much larger th[illegible]at of Mellaghi and Sumba; and (3) the yield in straw is most abundant * * *. The grain does not drop off readily when the crop is cut or when removed [illegible] the field to the threshing ground, so that there is no such waste as there is wi[illegible]e other descriptions of paddy. The grain is perfectly formed; there are few i[illegible] empty shells or husks. The plant grows most vigorously, and it would appear [illegible] it does not require so much water as indigenous paddy to bring it to maturity."

The Superintendent of Gover[illegible]t Farms in his annual report for 1871-72 wrote:—

"Paragraph 36. I report [illegible] results as showing how the one variety of paddy will grow and even thrive unde[illegible]cumstances that would be highly prejudicial to the other; but, from this, we a[illegible]t to infer, that the former (the country) is the better variety of paddy, thoug[illegible]r such specially *unfavorable* circumstaces it is, undoubtedly, the best * * *. The fact is, unimproved varieties of plants, like unimproved breeds of anima[illegible]nfer less, when opposed by unfavorable circumstances, than do the more highly [illegible]loped. Carolina paddy, is an improved variety of paddy, which has been caref[illegible]eared on the rich virgin soils of South Carolina. Our last year's experience prove[illegible] only that remunerative crops of country paddy, can be produced on a soil that [illegible]ther fails in producing a fair crop of Carolina paddy, but also, that a soil whic[illegible] year produces good crops of this grain may, in the next year, not be able to pr[illegible] even half a crop. Thus soils which, in 1870, yielded as much as 40 bushels p[illegible]e of Carolina paddy, yielded last season only half as much, though, equally as well [illegible]vated and manured, but, the explanation of this is simple; the soils which produce[illegible] good crops of Carolina paddy in 1870, were in a fresh state at the time the pad[illegible]s sown; they had not been under wet cultivation for several years; while, those so[illegible]st year with this paddy were under wet cultivation in the *previous* year, and had[illegible]me reduced by the stagnation of the irrigating water in the soil, to the condition [illegible]he more inferior descriptions of paddy land, that is, to a sour, unhealthy, soapy condition, in which atmospheric agencies could have no

effect for good, in which plant food is either locked up and rendered inert, or forms combinations more or less injurious to vegetable life, but with a surface to the depth of two or three inches in more or less healthy state. It is easy to understand why, on a soil in this condition, Carolina paddy seldom does well, while country paddy may thrive. The former feeds deep down in the soil; it has long deep roots varying in length, under average circumstances, from four to six inches, while few of the rootlets are horizontal. It is very different with the roo[illegible] of country paddy; nearly the whole of its rootlets radiate over the surface of the gro[illegible]nd at right angles to the stem of the plant. They are seldom more than two or thr[illegible]ee inches in length, and are so interwoven as to form a sort of net-work well suited for supporting the plant on the semi-liquid mud in which this paddy is usually cultivated. Hence, a soil in a bad physical state, if it only has a healthy surface two or thr[illegible]ee inches in depth, may produce fair crops of country paddy, though, it will entirely fail in producing a crop of Carolina paddy. On such a soil, the Carolina paddy would start as well as the country paddy, and, would continue to grow as well *until its roots began to penetrate below the aërated soil*, when, its growth would be checked and it would gradually turn yellow and sicken. The fact is, Carolina paddy cultivation, belongs to a higher condition of agricultural practice, than has yet been reached in this countr[illegible]."

Less water needed by Carolina paddy.

36. The opinions of the Experimenters agreed generally, as to the smaller quantity of water needed by the Carolina plant than for the country paddy plant, and the opinion was also equally generally held that the Carolina crop suffers less, than does a crop of country paddy, when temporarily deprived of irrigation water. If, as has been [illegible]hown to be the case, in several instances, the roots of the Carolina paddy plant feed deep down in the soil, while those of the country paddy plant feed in the surface soi[illegible] it is easy to understand why the former suffers less than the latter, when irriga[illegible] water is temporarily withheld. The following extracts confirm this view;—

"It (Carolina paddy) is not so much affected [illegible] a temporary failure of water as the indigenous plant."

"It requires certainly not more than one-[illegible]rter of the water necessary to produce an ordinary crop."

"Much water is injurious rather than benefic[illegible] heavy rains during the first six

"Carolina paddy is very injuriously affected [illegible]uld be kept constantly flooded weeks of its growth."

"I think it is very essential that the beds [illegible]uring the second month as little during the formation of the grain; on the other han[illegible] water as possible should be given."

"I am of the opinion that high lands are [illegible] suitable than low lands for the culture of Carolina paddy."

"Lighter and friable soils produced the best [illegible]ts."

"Where the soil was too clayey and impervio[illegible]e plants did not succeed."

"Paddy land of a retentive character situate[illegible] a low level, resting on a stiff sub-soil through which there is no natural draina[illegible]r filtration, invariably becomes sour and unhealthy, after producing a crop of pad[illegible]onditions quite opposed to the successful cultivation of Carolina paddy."

"I find that clayey lands are not well adap[illegible]or the cultivation of Carolina paddy."

"Excess of water in the land proves injurious [illegible] the crop."

Good tillage needed for Carolina paddy.

37. A number of the [illegible]xperimenters agree as to the necessity for the more perfe[illegible]llage of land for Carolina paddy than for country paddy.

"Its cultivation is said to entail upon the [illegible]ssidars more labor than country varieties; the land requires to be ploughed deepe[illegible]

"This cereal must have a deep cultivated so[illegible]

"The want of success in the cultivation I attribute entirely to shallow ploughing."

"A very much greater crop of Carolina paddy can be obtained under high cultivation than of country paddy."

The Acting Sub-Collector of Salem, in submitting his report, remarked:—

"I am convinced that the Carolina paddy is far more productive than any of the indigenous kinds, and that it is so has been shown by my first experiment."

The Acting Collector of Malabar wrote:—

"The experiments were, I think, pretty successful considering the ignorance of the individuals who made them with regard to the best mode of cultivation and the best soil adapted to the growth of the plant. All soils have been tested—common rice lands, garden land, and dry paremba lands. The seed was sown broadcast and in beds, and the plants were in some instances transplanted, and in others left in the beds in which they were first sown."

The Collector of Salem wrote:—

"The peculiarities which I observed in the Carolina crop are—

"1*st*.—That it grows and ripens much faster than the ordinary country kind.

"2*nd*.—That the stalks are thicker and better able to stand the weight of the ear than the country paddy; it contains a larger number of grains. The country paddy stalks being very thin they bend, and the consequence is that much of the grain is lost on the ground before the crop is cut."

The Deputy Collector of Naidupet wrote:—

"The Carolina paddy has this advantage over the Peshanum (the best paddy in the Nellore District), that it is a p of only 4 months' growth, whereas the Peshanum requires fully 6 months to co maturity, and it (Carolina paddy) would beyond doubt fetch as good a price in the rket as the Peshanum owing to the superior quality of the rice."

The Agent of the Shivagunga Zer ri wrote:—

"I do not hesitate to say the Carolina paddy has the following advantages over the best descriptions o dy, viz., Mellaghi and Sumba, grown in this zemindari:—(1) It reaches matur n 4½ months and like the Mellaghi and Sumba which are ripe for the sickle on ter the lapse of 6 months; (2) the outturn of Carolina paddy is much larger th at of Mellaghi and Sumba; and (3) the yield in straw is most abundant * * *. The grain does not drop off readily when the crop is cut or when remove the field to the threshing ground, so that there is no such waste as there is wi e other descriptions of paddy. The grain is perfectly formed; there are few i empty shells or husks. The plant grows most vigorously, and it would appear it does not require so much water as indigenous paddy to bring it to maturity."

The Superintendent of Gover t Farms in his annual report for 1871-72 wrote:—

"Paragraph 36. I report results as showing how the one variety o paddy will grow and even thrive unde umstances that would be highly prej judicial to the other; but, from this, we a t to infer, that the former (the cou try) is the better variety of paddy, thoug r such specially *unfavorable* circum undoubtedly, the best * * *. The fact is, unimproved varie taces it is, like unimproved breeds of anima ifer less, when opposed by unfav ics of plants, stances, than do the more highly loped. Carolina paddy, is an im orable circum- of paddy, which has been caref ared on the rich virgin soils of Our last year's experience prove only that remunerative crops of proved variety can be produced on a soil that a ther fails in producing a fair c South Carolina paddy, but also, that a soil whic years produces good crops of t country paddy, the next year, not be able to pr even half a crop. Thus soi ary yielded as much as 40 bushels p e of Carolina paddy, yielded l gener rop of Carolina as much, though, equally as well vated and manured, but, the ex was ob grain may, in simple; the soils which produce good crops of Carolina padd rice is which, in 1870, a fresh state at the time the pad s sown; they had not been u season only half for several years; while, those so st year with this paddy were way plication of this is tion in the *previous* year, and had me reduced by the stagnatio which in 1870, were in water in the soil, to the condition the more inferior descriptions under wet cultivation is, to a sour, unhealthy, soapy condition, in which atmospheric age of the irrigating of paddy land, that would have no

effect for good, in which plant food is either locked up and rendered inert, or forms combinations more or less injurious to vegetable life, but with a surface to the depth of two or three inches in more or less healthy state. It is easy to understand why, on a soil in this condition, Carolina paddy seldom does well, while country paddy may thrive. The former feeds deep down in the soil; it has long deep roots varying in length, under average circumstances, from four to six inches, while few of the rootlets are horizontal. It is very different with the roots of country paddy; nearly the whole of its rootlets radiate over the surface of the ground at right angles to the stem of the plant. They are seldom more than two or three inches in length, and are so interwoven as to form a sort of net-work well suited for supporting the plant on the semi-liquid mud in which this paddy is usually cultivated. Hence, a soil in a bad physical state, if it only has a healthy surface two or three inches in depth, may produce fair crops of country paddy, though, it will entirely fail in producing a crop of Carolina paddy. On such a soil, the Carolina paddy would start as well as the country paddy, and, would continue to grow as well *until its roots began to penetrate below the aërated soil*, when, its growth would be checked and it would gradually turn yellow and sicken. The fact is, Carolina paddy cultivation, belongs to a higher condition of agricultural practice, than has yet been reached in this country."

Less water needed by Carolina paddy.

36. The opinions of the Experimenters agreed generally, as to the smaller quantity of water needed by the Carolina plant than for the country paddy plant, and the opinion was also equally generally held that the Carolina crop suffers less, than does a crop of country paddy, when temporarily deprived of irrigation water. If, as has been shown to be the case, in several instances, the roots of the Carolina paddy plant feed deep down in the soil, while those of the country paddy plant feed in the surface soil, it is easy to understand why the former suffers less than the latter, when irrigation water is temporarily withheld. The following extracts confirm this view;—

"It (Carolina paddy) is not so much affected a temporary failure of water as the indigenous plant."

"It requires certainly not more than one- rter of the water necessary to produce an ordinary crop."

"Much water is injurious rather than benefic eavy rains during the first six weeks of its gro app uld be kept constantly flooded

"Carolina pad is very injuriously affected ring the second month as little during the formation of the grain; on the other han suitable than low lands for the water as possible should be given."

"I am of the opinion that high lands are ts." culture of Carolina paddy."

"Lighter and friable soils produced the best ne plants did not succeed."

"Where the soil was too clayey and impervio a low level, resting on a stiff sub-soil through which there is no natural draina r filtration, invariably becomes sour and unhealthy, after producing a crop of pad onditions quite opposed to the successful cultivation of Carolina paddy."

"I find that clayey lands are not well adap or the cultivation of Carolina paddy."

"Excess of water in the land proves injurious the crop."

Good tillage needed for Carolina paddy.

37. A number of the perimenters agree as to the necessity for the more perfe llage of land for Carolina paddy than for country paddy.

"Its cultivation is said to entail upon the ssidars more labor than country varieties; the land requires to be ploughed deepe

"This cereal must have a deep cultivated so

"The want of success in the cultivation I attribute entirely to shallow ploughing."

"A very much greater crop of Carolina paddy can be obtained under high cultivation than of country paddy."

On the other hand, some Experime
much more elaborate preparation of t
Carolina paddy sends its roots furt
paddy plant are always near the
limited feeding area.

ers assert that the country paddy requires a
soil, than Carolina paddy, because, while the
r in search for food the roots of the country
face of the soil, and therefore have a more

Reasons for failures in experiments.

38. Many
attended so m
"There is I fear too much reas
was distributed were rather dispo
Government, on becoming aware of
should determine to raise their rent
"The experiments seemed to ha
"I believe also that the culti
Ryots. They do not approve of th
yielded."

reasons are given for the failures that have
y of the experiments.
to believe that Natives to whom the paddy
l to report unfavorably upon it, fearing that
o heavy crops that can be raised on their land,
in proportion."
been unpalatable to the Mirassidars generally."
tion did not receive proper attention from the
condition to give up one-fourth of the produce

"The reasons generally giver
deficiency of rain in the early part
of the season."
"Much of the seed supplied w
"Hares injured many plants,
"A large portion of the plant
"A flood came and washed a
"Unfortunately three-fourth
"When the plants were in
The Deputy Collector of Naidup
"Convinced as I am that
care and labor bestowed on the
of the Vadasamba fields similarl
in some cases was even worse,
and which have thus escaped t
have thrived better."

for unsuccessful results in all these cases are
the season and to much rain in the latter part

evidently inferior."
id rats and birds ate up most of the grains."
were destroyed by cattle."
y greater part of the plants."
f the plants rotted from being in
a storm occurred and injured the
marked:
Carolina did not yield a crop
ation, my eyes are not shut
uated have shared the same
ugh the fields sown a week
eavy rains at the earliest st

dated."
em."
commensurate to the
to the fact that several
fate, and the produce
r two earlier or later,
ge of the plantation,

There cannot be any doubt
failed from such causes as are
would have proved equally det

that by much the largest nu
tioned in the preceding ex
tal to country paddy similar

mber of experiments
ects, causes which

39. Where country paddy
place at the season of the ye
watering can be most satisfact
experiments, was sown at uns
not have been favorable for co
delay in receiving the seed, but
that the real reason why the
by many Ryots was a desire,
information, by the aid of whic

grown, care is taken that the
t is the most appropriate,
performed. But, the Carol
able times, and under circu
paddy. In some instances,
many cases there are good gr
lina paddy was exposed to u
their part, that the experime
fertility of their land could

ircumstanced.
ings shall take
pen ploughing and
ina paddy in many
nstances that would
this was caused by
ounds for believing
favorable conditions
nt should not afford,
e ascertained.

40. It was perhaps, but
course of
tors, the
the amou
following
Carolina paddy Experimenters,
were unpopular:—

Cultivators suspicious regarding object of experiments.

al that the Ryots should view
on suggested by Tahsildars,
ials who have so much to do
f the rent. If, the arrangemen
act, was at all generally followe
is not to be wondered at tha

with suspicion, any
or Revenue Inspec-
with the fixing of
t described in the
d, in dealing with
t the experiments

"I propose that an agre
this experiment (Carolina padd
of soil might be entered and
for the sickle, he will cut and k
who will be deputed for that w
accurate account of the expenses incurred by him from the beginning to the end
of the experiment; and that, the paddy shall be threshed and clean
Revenue Inspector who would give an account to the Tahsildar."

t should be taken from the Ry
which the number of the field,
ndition added, that after the cro
he same in the possession of a Re
by the Tahsildar; and that, he wil

ot consenting to
area, and nature
becomes ready
venue Inspector
l render me an
sed before the

That in many instances the Ryots did not give true returns is evident from the facts noticed in several of the reports. For instance;—

"The Ryot to whom the seed was given for experiment reported an outturn of 22 measures but now, he admits the outturn was 250 measures. He had, it seems, concealed the facts, fearing that half of the produce would have been taken from him, as the Government share."

The Collector of South Arcot, in submitting this case to Government remarked;—

"The information disclosed in this letter illustrates the peculiar genius of the native Ryot, and shows, how strange are still the idiosyncracies of the cultivating classes generally, in regard to their position with, and treatment, by the Government; and, it seems almost incredible that in the present day, and with all the means of intercourse with European and educated native officials enjoyed by the people, any, but the most boorish and uncivilized, should be found to express the sentiments entertained by the Ryot Kistniah, who, to avoid being overreached as he thought, by the officers of Government, has attempted to deceive, by rendering a false account of the results of his experiment with the Carolina paddy seed given to him freely for testing its comparative value with the common paddy of the country."

41. That in many instances, the Ryots entered upon the experiments with great hesitation and suspicion is evident, from the frequent references to this state of feeling in so many of the reports, thus;—

"I have explained to many persons duri the past year that no enhancement of the assessment is contemplated on the intro tion of Carolina paddy, an announcement which was received with evident relie

"The illiterate Ryot has no faith in the oduction of this foreign cereal; if he undertakes at all its cultivation, it is because h as told to do so by the Tahsildar or the Revenue Inspector. The wealthy Ze ndars and Land-owners are equally indifferent to all agricultural improvement;"

"———— is entitled to much credit for the interest taken in the experiment by him in spite of the odium he had to endure."

42. It was feared that, in the climate of Madras, the Carolina paddy would gradually deteriorate; but, it appears to have great power in adapting itself to the varying conditions of the climate of this country. No deterioration in the quality of the grain does appear to have occurred to any appreciable extent, when the crop has been grown under suitable conditions. Regarding this, the Superintendent of Government Farms in a report to the Board of Revenue wrote;—

Climate of Madras not unsuited to Carolina paddy.

"Carolina paddy, which has been grown in this country under suitable circumstances, is in no way inferior to the seed imported from America. One of the best crops I grew last season, 2,000 lbs. per acre, was from seed in the third generation since imported; and, I have just issued a fine parcel of grain (the fifth generation) the produce of seed, which formed part of the yield of that crop, which was quite equal to the seed we imported from America. Deterioration does undoubtedly take place when the crop is grown under unfavorable circumstances, but it must be remembered that all our cereals deteriorate if sown, at the wrong season, on exhausted, or imperfectly-cultivated, soils. But, deterioration is less to be feared than, *the loss of purity in the sample*; fully 50 per cent. of the samples of country-grown Carolina paddy, that have been forwarded to me, contain indigenous paddy, varying in amount *from 10 to 50 per cent.* The presence of this country paddy, amongst the Carolina grain, is altogether due to the late period in growth at which Ryots harvest their paddy; they generally wait until the crop is *dead* ripe, when from 10 to 15 per cent. of the grain is shed by the wind, and in the harvesting of the crop, the result being, that after the removal of a crop of country paddy, the soil generally is sufficiently well seeded for another crop."

Carolina paddy seed largely mixed with country grain.

And on the same subject the Deputy Collector of Naidupett remarked:—

"I should not fail to bring another fact to your notice that when the crop was in ear, it was found that there was a large mixture of Vadasamba in all the fields

It was therefore evident that the Ryot, to whom I had entrusted the seed, had not taken proper care in securing it. He says, there must have been a mixture of some seed of Vadasamba in the field sown in 1871, and that, it has multiplied itself largely in the crop of that year, and, as the seed for the experiments of 1872 was selected from that crop, the admixture, is greater in the present crop."

Carolina paddy will degenerate if not grown under suitable conditions.

43. The Carolina paddy will certainly degenerate in this country and revert towards the type of the species from which it originated if, it is grown under less favorable conditions of soil manure or tillage than in America.

Pure Carolina paddy seed cannot now be got in Madras.

44. Though a very large quantity of Carolina paddy has been raised in this Presidency, there are grounds for believing that, at present no pure seed can be obtained in it in any quantity. Recently, every Collector was asked to furnish a supply from his District and, by none of the Districts could any pure seed be supplied. This may have been due to the Ryots not caring to part with the seed but, such an explanation is improbable, seeing that, liberal prices, would have been paid for it.

45. It was supposed that the Carolina paddy would hybridize with indigenous varieties of paddy, but, in this Presidency there is no direct evidence that this has occurred; though, when Carolina paddy is growing side by side with country paddy and, both are in flower at the same time, it is not at all improbable but that they may hybridize. But, if the general disappearance of *pure* Carolina paddy seed in this Presidency is [illegible] way to be attributed to hybridization, the result, though [illegible] what was anticipated, or, hoped for, will not be altogether [illegible] benefit. Though, the absence of pure seed is unsatisfactory as regards the introduction of the Carolina paddy crop into this country, in view [illegible] the production here, of a rice for export equal in quality to that exported from America, there can be no doubt but that, the introduction of such a large quantity of good seed has been attended with benefit to our agriculture.

If hybridization has occurred the country paddy will have been improved.

46. The introduction of a new agricultural crop, is attended with difficulties in all countries; in India, those to be encountered, are perhaps greater than in any other country. However, had the same interest been taken in all the experiments, that is so noticeable in the reports of several, the general results would have been very different, to those obtained.

47. In dealing with a class of people, so ignorant and suspicious as is the cultivating class in this Presidency, it is not good policy, to entrust the introduction of new crops to officers whose duty it is to collect the land revenue. As long as the annual rent is practically unfixed, and depends in amount greatly upon the views held by these officers, so long will the Ryots view with suspicion any course of action they suggest. Further, seeing that, the rent is assessed by the Settlement Department on the results of field experiments, differing but slightly in character to the Carolina paddy experiments, it was not to be expected that the Cultivators would discern the difference; and hence, they would not attempt to remove, or ameliorate any drawbacks which the experimental crops might encounter.

Agricultural experiments troublesome and costly.

48. But, there is still another reason, to which the non-success of many of the experiments may be attributed, viz. *the trouble and expense that attends the carrying out of a field experiment.* To this subject, the following extract from a report by the Superintendent, Government Farms, refers;—

"Heretofore far too much has been expected from this annual expenditure of about one thousand Rupees on the distribution of seed. Ten or a dozen experiments are expected from each of the nineteen Collectorates. Agricultural experiments are costly and troublesome. Those unacquainted with the actual details of Farm Management, have not the least idea, how work is delayed (often during a very wet harvest when every moment is so important) by the necessity of carefully reaping, carting, weighing; housing, drying, weighing; threshing, weighing, &c., the produce of one or more

experimental plots, it often has been a cause of wonder to me, that the Ryot should put himself to so much inconvenience and loss, in conducting our experiments, seeing that, in so very few instances does he really understand the object of the experiments; and, it is not in the least surprising, that in the majority of cases, he secures his regular crops first, and leaves the experimental crops to their fate. I would very strongly advise, that, not only should the distribution of good seed be continued, but that, the practice should be very greatly extended; but, instead of issuing the seed, as at present, to a certain number of Ryots in each Collectorate would invite volunteers to come forward to make the experiments; it may, I think, be accepted as a fact, that if we cannot get volunteer agents to make our experiments, that those made by unwilling agents will possess but little value. With a view of repaying the Ryot, for his trouble and expense and stimulating his energy, I would suggest that small prizes, varying in amount from 20 to 50 Rupees should be offered for the best crop and best report (simple details of culture and observations) of any particular crop it is desirable to introduce into a new locality. Our great English Societies find it necessary, to offer medals and pieces of plate varying in value from 20 to 50 Guineas, to effect the same object; and if, this is necessary in England, in the present day, it must be much more so in this country with its backward civilization and wretched agriculture."

49. The suggestions, made in the preceding extract, met with the general approval of the Board of Revenue and, the Superintendent of Government Farms was directed to submit the outline of a scheme for giving effect to some of his proposals. From the scheme submitted the following extracts are taken;—

"2. Probably the most convenient arrangement would be to limit competition for these special prizes to certain tracts of country, and to select a fresh tract annually. The groups of districts adopted by the Board [illegible] well suited to form the areas of competition. The group denominated East Cent[illegible] which includes Madras, Chingleput, North Arcot, and South Arcot, should, I think, b[illegible] first selected. The Madras District contains but a small area of agricultural land; [illegible], as much of its wet land is generally well situated as regards position and manure, f[illegible] Carolina paddy cultivation, it seems desirable that the same inducements should be [illegible]ered in it as in the other Districts.

"3. The prizes, to be offered for competitio[illegible] in this group, might be as follows:—

					Rs.
Four first-class	prizes, 50	Rupees ea[illegible]	..	..	200
Eight second-class	,, 25	,,	..	..	200
Sixteen third-class	,, 12½	,, ,,	..	..	200
Thirty-two fourth-class	,, 6¼	,, ,,	..	..	200
Four Tahsildars'	,, 50	,, ,,	..	..	200
		Total	..	..	1,000

"4. Each District in the group will thus have allotted to it: one Tahsildar's prize, one first-class prize, two second-class prizes, four third-class prizes, eight fourth-class prizes. The Tahsildar's prize should be awarded to the Tahsildar in whose Taluq the largest area of Carolina paddy is grown during the year. The other prizes should be awarded to the growers for quality of produce.

"5. A better way would be to give the prizes for the *best crops*, but this could not be done: the Collectorates are far too extensive, and the means of transit too imperfect, to allow of isolated plots of Carolina paddy in distant parts of the Districts being inspected; but, as matters improve, smaller areas of country, even Taluqs, may be selected, and prizes offered for the *best crops* within these areas. We should, I think, first deal with groups of Districts, next with Districts, and finally with Taluqs. I should certainly prefer to reverse this order of arrangement, but the demands for immediate action in *all* parts of the Presidency are too pressing to wait the action of the *slower*, though certainly more certain way of producing the desired result.

"6. My proposal is, therefore, that, during the period ending on the last day of April 1874, competition in the cultivation of Carolina paddy should be invited in the

section of country known as the East Centre, and that the inducements to be offered should be the prizes detailed in paragraph 3 of this letter, to be awarded under the following conditions:—

(1.) That each entry consist of, at the least, 200 lbs. of the unthreshed crop in the sheaf, and 100 lbs. of the clean grain.

(2.) That the whole of the produce exhibited under each entry shall have been cultivated and produced by the exhibitor.

(3.) That the crop of which the entry is a part shall have been grown on, at the least, 1,000 square yards of land.

(4.) That each entry be accompanied by a statement showing details of cultivation and general results (to be entered in a form to be provided) with simple observations made during the growth of the crop, the accuracy and value of which will receive due weight in awarding the prizes.

"7. Every facility should be offered for obtaining seed, which should be supplied to applicants free of all cost; and suggestions for cultivation should be freely distributed, though it should be thoroughly understood that it will be more satisfactory in every way if each competitor will do exactly as he thinks best in cultivating the crop.

"8. If these proposals are allowed to form a part of the general scheme for agricultural shows, the other details might be disposed of in Committee.

"9. I would add that it would be well, I think, if for a year or two, or until a demand is created, Government would purchase for export all the Carolina paddy of good quality produced in this part of the Presidency. I believe that the growers would be satisfied with a price slightly over the price obtained for ordinary country paddy; and, with the means at disposal here, the arrangement could, I think, be worked at very little expense to Government. At present there is no local demand for this paddy, and the samples are irregular and of such a small bulk that no merchant considers it worth collecting for export.

"10. Carolina paddy will certainly never entirely displace the ordinary native varieties of paddy, though, in some situations and under some circumstances, it may make its way amongst cultivators, if only a market for it existed.

"11. I offer these suggestions as something in this direction might be done in connection with other means to be applied to introduce this variety of paddy into general cultivation. If Carolina paddy is ever to become a staple production of this country, it must be introduced by other means than simply broadcasting good seed over the country. There is too much of doubt and uncertainty connected with experimental crops for incomes so precarious as those enjoyed by our Ryots."

Regarding the foregoing the Board of Revenue observed:—

"Mr. Robertson suggests in the letter before the Board a modification of the system now found so successful by the Royal Agricultural Society and others which seek the improvement of agriculture by offering prizes and holding competitive exhibitions, viz., that of confining the attention periodically to a limited and well-defined and similar area at a time, and changing those areas in such a manner that the whole country comes consecutively under the operation and attention of the Society.

"2. Mr. Robertson proposes to take up the East Centre District, and confine attention to Carolina paddy. The Board consider the proposals sound and worthy of adoption; the prizes are well classified and conditioned, and they would accept them for a year's trial.

"3. But Mr. Robertson has hit the real difficulty in extending the cultivation of this improved grain. There is no local taste or demand for this new specie of rice, and it is not grown in sufficient quantity to find a place in the market."

Government approved generally of the proposals, but objected to supply the seed gratis, to purchase the paddy produced, or to give prizes to Tahsildars, and, directed that, Mr. Robertson's proposals should receive a trial for one year. Accordingly the following Notification was published:—

"NOTIFICATION.

"With a view to encourage careful husbandry, the Board of Revenue have obtained the sanction of Government to the grant of prizes in four Districts during the current year.

"The Districts will be Chingleput, Madras, North and South Arcot.

"The prizes will be given for the best crop of Carolina paddy, and will consist of one prize of 50 Rupees, two prizes of 25 Rupees each, four prizes of Rupees 12-8-0, and eight prizes of Rupees 6-4-0 in each of the above four Districts.

"The following are the conditions of the competition:—

"1. That each entry consist of, at the least, 200 lbs. of the unthreshed crop in the sheaf, and 100 lbs. of the clean grain.

"2. That the whole of the produce exhibited under each entry shall have been cultivated and produced by the exhibitor.

"3. That the crop of which the entry is a part shall have been grown on, at the least, 1,000 square yards of land.

"4. That each entry be accompanied by a statement showing details of cultivation and general results (to be entered in a form to be provided) with simple observations made during the growth of the crop, the accuracy and value of which will receive due weight in awarding the prizes.

"Ryots and others desiring to compete may obtain seed on payment of the cost, which will be the market-price of good country paddy, through the Collector of their District, from the Superintendent, Government Farms. They should apply as soon as possible to the Collector stating the quantity of seed they require and requesting that they may be supplied with a copy of the form annexed."

With this Notification the following Memorandum was published:—

"*Hints on the Cultivation of Carolina Paddy.*

"*Soil, etc.*—Carolina paddy has a very strong aversion to stagnant water; therefore avoid all land on which, from imperfect drainage, water is likely to collect and stagnate. Remember that water may stagnate in the soil as well as on its surface. Select good healthy paddy-land resting on a moderately porous sub-soil and with a surface sufficiently high that it will not become a swamp during the rains while it is yet sufficiently low to admit of being watered at a moderate cost. In the endeavour to avoid a soil that is too retentive take care that you do not select one that parts too readily with its moisture, as a soil with this defect is as objectionable as one that is too retentive. Endeavour to select a soil that is neither too retentive nor too porous; in every taluq there are hundreds of acres of wet land that fulfil these conditions. These observations refer chiefly to the physical or mechanical condition of the soil. It is of much greater importance to secure a soil in a good physical condition than one in a high manural condition, as by the application of a suitable quality and quantity of manure the last-mentioned condition can so readily be secured. Land which is being put under irrigation for the first time will nearly always produce good crops of Carolina paddy.

"*Preparation of the Soil.*—The soil may be ploughed and worked in the dry state for sowing, or it may be ploughed under water and puddled for sowing. I much prefer the former arrangement; the latter is sometimes attended with advantages, but the evils which result from the wretched state in which the soil is left by the process are frequently of a very serious kind. But, whatever plan you adopt, take care to give the soil a liberal application of good manure during the time it is being prepared for the reception of seed.

"*Seed and Sowing.*—Choose a fresh sample of seed; it should be of a rich golden color; the sample should be uniform both as regards color and the size of the grain; if the seed is mixed with the seed of country paddy (which is the case almost invariably with all country-grown samples), and you cannot get a pure sample, you may, by

using a fan and a bamboo sieve, remove the greater portion of the indigenous grain. Before you finally select the seed you should test its vitality. You may do so in the following way :—

"Take a shallow vessel—a soup-plate will answer admirably; place about one inch deep of good garden soil in the plate, and scatter over the soil 100 paddy seeds; cover this with a piece of muslin, and over the muslin place about half an inch of soil. Keep the soil damp. After a few days the muslin with the upper soil may be lifted off and the condition of the seed ascertained. The number of seeds that have germinated will give the percentage of vital seeds. But you had better make duplicate experiments and take the average of the results obtained as the percentage of vital grain; ascertained in this way the results of the test are more trustworthy.

"Having selected suitable seed, and having prepared your land for its reception, you may proceed with the sowing. You may sow the seed at once on the land, or you may sow it in seed-beds and afterwards transplant the seedlings into the field. If you adopt the former of these arrangements, you may sow say, at the rate of fifteen measures per acre on either dry or puddled soil; if on dry soil, you may take the seed in its natural state and broadcast, or drill it in the soil; but, if you prefer to sow on a puddled surface, you may sprout the seed before you sow it. When transplanting is preferred, take care that the nursery-bed is *deeply* dug and thoroughly manured. When this is done the roots of the seedlings are small and compact, and the plants can be raised with ease and without suffering any injury in the operation. To produce seedlings for transplanting, sow eight measures, or about 18 lbs. of seed in the nursery-beds, for each acre of land to be planted; less will probably suffice, but this quantity will provide against any loss of plant. The seedlings may be lifted for transplanting when three or four weeks old: they may be planted in the field in the puddled, or wet soil, at distances of from six to nine inches apart, a couple of seedlings being planted together. It may be good practice either to sow the seed at once in the field, or to sow it first in the nursery, and afterwards to plant out the seedlings in the field. Thus, when the area to be sown is large, the season late, labor scarce, and seed plentiful and cheap, we would adopt the former plan, and the latter, when seed is scarce and dear, the area to be cropped small, the weather favorable, and labor plentiful.

* "*Irrigating.*—In whatever way the land is sown or planted, it should be moderately watered on the same day; this fixes the roots of the seedlings and enables the seed to meet with a good bed. It is seldom necessary to flood the land, especially after the plants begin to shade the soil. The endeavour should be to keep the land constantly damp, and not alternately in a state of puddle and dry and filled with large cracks, as is too commonly the case with wet land under ordinary paddy.

† "*After-cultivations.*—These are of a very simple nature; it is only necessary to keep the crop free of weeds and to thin out a few of the plants if the crop grows too luxuriantly.

"(Signed) W. R. ROBERTSON, M.R.A.C.,
Superintendent of Government Farms.

5th September 1873.

"*N.B.*—The foregoing are intended only to be suggestive. Each cultivator may adopt whatever plan of cultivation he prefers."

Seed was not available for use of intending Competitors.

50. Unfortunately, the seed required to enable intending Competitors in the area of country in question, to undertake experiments, was not available; hence only a few experiments were made. It is much to be desired that the scheme should have another trial, for a year, or more, when a sufficient amount of seed is available.

General Conclusions.

51. On the whole, a fair amount of success has attended these experiments. The failures are, in many instances, to be attributed to ordinary causes under control in average seasons, and to mismanagement, or, wilful neglect.

* The practice suggested here is based on experience obtained in the neighbourhood of Madras where the evaporation is great. In districts where the evaporation is less, and where the soil is moderately retentive, the American irrigation practice might be substituted.

† Hoeing is very beneficial and should be performed.

52. There, can be no doubt but that, the seed was too widely and too indiscriminately distributed. Too much was attempted; it would have been much better in every way, to have had half a dozen well-managed experiments in each District, instead of, a score or more managed as too many were.

53. Excepting, in the records of the latter experiments, the minute history of the crops has been but seldom noticed, and of such experiments it is of course impossible to form any definite opinion, as to the causes of the successes, or, failures.

54. Too little importance has been attached to the labor, trouble, and inconvenience that attends the carrying out of a field experiment. Until this, is fully recognized and, something is done to compensate the Cultivator who, undertakes such experiments, there is but little hope that they will become popular amongst our cultivating classes.

55. When our experiments are undertaken unwillingly, it is highly improbable that any satisfactory result will be obtained; it is always so easy to cause the failure of a crop and, the failure, at once puts an end to all trouble in the matter.

56. It should be borne in mind that these experimental plots, were frequently sown out of the usual sowing season, and that, therefore, if the crops did mature, they would be ready for the sickle when but few other crops were ripe, and would therefore constitute the feeding grounds of birds, squirrels, rats, insects, &c., which, in the ordinary harvest season, would have a greatly more extended feeding area, and therefore, would be less severe in their depredations on individual crops.

57. It has been proved, that the Carolina paddy reaches maturity as early as any other species of paddy grown in this Presidency; and that, the quality of its grain is, at the least, as good as that of any other variety grown.

58. Taking the whole of the results obtained, there was an amount of discordancy impossible to reduce to anything like harmony yet, by weeding out freely all those which are admittedly failures, from floods, trespassing cattle, depredation of hares, insects, &c., or by a deficiency in the water-supply, &c., results, which are clearly inaccurately recorded, and, these of experiments conducted on too insignificant a scale, we secure something like harmony; at any rate such harmony as only could be reasonably expected in experiments conducted under such varying circumstances and over such a vast area of country. This evidence, shows, decisively, that the Carolina paddy is well suited for cultivation in this Presidency; but that, it needs better treatment at the hands of the Cultivator than that to which country paddy is usually subjected.

59. The yield obtained was, in many cases, very satisfactory, but the number-of-fold standard, adopted so frequently in the reports, is no test at all, of the producing powers of the plant, when raised under different condition but, is rather a test of the physical and chemical condition of the soil, upon which the plants were grown. The fallacy of judging of the qualities of the Carolina paddy plant, from the relation the yield bore to the seed sown, is recognized, at once, when the fact is known that, in one field, from the same seed, a return of 30-fold, and of 120-fold were obtained.

60. The Carolina paddy plant, apparently, has the power of adapting itself to very varying circumstances. Though, there is a wide difference between the climate of this Presidency and, that of South Carolina, the difference between the climates* of the *cropping seasons* of the two countries is not considerable. The period of growth and maturation of a crop depends greatly upon the total amount of heat it receives, and, this total amount, does not differ greatly, within a certain range of climate, for where the temperature is lower, the crop takes a few days longer in reaching maturity than where a higher temperature prevails, other conditions being equal. Thus, the amount of heat needed to mature a crop of paddy is, approximately the same, whether the mean temperature of the District in which it is grown is 70 degrees, or 80 degrees. The number of days, the crop is in reaching maturity multiplied, by the mean temperature, of each month, will give the heat required by the crop, as shown below :—

* Of course, we need to know more than the mere average temperature of a locality in order to determine whether the climate of that locality is fitted for certain crops.

SOUTH CAROLINA.

Average date of sowing—15th of April.
Do. of reaping—15th of September.

—	Average Mean Temperature of the Month.	Total.
April, 15 days ..	57·0	855·0
May, 31 do. ..	69·8	2163·8
June, 30 do. ..	74·1	2223·0
July, 31 do. ..	79·4	2461·4
August, 31 do. ..	76·2	2362·2
September, 15 do. ..	73·1	1096·5
		11,161·9

KISTNA DISTRICT.

Average date of sowing—1st of August.
Do. of reaping—15th of December.

—	Average Mean Temperature of the Month.	Total.
August, 31 days ..	83·4	2,585·4
September, 30 do. ..	82·2	2,466·0
October, 31 do. ..	80·4	2,492·4
November, 30 do. ..	77·3	2,319·0
December, 15 do. ..	74·7	1,120·5
	..	10,983·3

MADURA DISTRICT.

Average date of sowing—1st of October.
Do. of reaping—15th of February.

—	Average Mean Temperature of the Month.	Total.
October, 31 days ..	80·0	2,480·0
November, 30 do. ..	78·3	2,349·0
December, 31 do. ..	76·5	2,371·5
January, 31 do. ..	76·3	2,365·3
February, 15 do. ..	78·4	1,176·0
	..	10,741·8

COIMBATORE DISTRICT.

Average date of sowing—15th of August.
Do. of reaping—31st of December.

—	Average Mean Temperature of the Month.	Total.
August, 16 days ..	76·9	1,230·4
September, 30 do. ..	77·1	2,313·0
October, 31 do. ..	76·3	2,365·3
November, 30 do. ..	75·4	2,262·0
December, 31 do. ..	73·6	2,281·6
	..	10,452·3

MADRAS DISTRICT.

Average date of sowing—16th of October.
Do. of reaping—28th of February.

—	Average Mean Temperature of the Month.	Total.
October, 15 days ..	77·8	1,167·0
November, 30 do. ..	77·7	2,331·0
December, 31 do. ..	79·8	2,473·8
January, 31 do. ..	74·9	2,321·9
February, 28 do. ..	77·0	2,156·0
..		10,449·7

KURNOOL DISTRICT.

Average date of sowing—15th of August.
Do. of reaping—31st of December.

—	Average Mean Temperature of the Month.	Total.
August, 16 days ..	81·2	1,299·2
September, 30 do. ..	79·6	2,388·0
October, 31 do. ..	79·3	2,458·3
November, 30 do. ..	76·4	2,292·0
December, 31 do. ..	74·5	2,309·5
..		10,747·0

The foregoing illustrations, are not so representative as could be desired. But the necessary meteorological data was not available for all the Districts. We have, in different parts of this Presidency two distinct seasons for sowing paddy; that is, the season which is inaugurated by the advent of the South-west monsoon and, that which begins with the appearance of the North-east monsoon; the temperature of the two seasons calculated as above differs but little. There is but a slight difference between the amount of heat required to mature a crop of paddy in this Presidency and in South Carolina, thus;—

Two cultivating seasons in Madras.

Districts.	Amount of Heat needed to mature a Crop of Carolina Paddy.
	Degrees.
Kistna	10,983
Madura	10,741
Coimbatore	10,452
Madras	10,449
Kurnool	10,747
South Carolina ..	11,161

The dates of sowing and reaping, given in the foregoing tables, are only approximately correct for, there is considerable diversity in the dates given in the returns of each District, due possibly, to the crops being cut at different stages of maturity. However, the dates are as correct, as the information available permits.

61. It may be assumed that, in all parts of this Presidency Carolina paddy matures in $4\frac{1}{2}$ months, that is, will be fit for cutting, though the straw may not be ripe, in $4\frac{1}{2}$ months from the date of sowing. In America, it is clearly established, that the

crop needs five months to reach maturity, and the American Planter always cuts the crop immediately the grain is hard, a much earlier stage than at which, in this country, it is usual to harvest paddy.

62. It has been proved that plants usually need each a particular climate; a temperature, which is favorable to one, is hurtful to another and, fatal to a third; hence, there are limits to the migration of species of plants; but some plants have a greater power of adapting themselves to new conditions than others. The paddy plant appears to have the power of modifying its habits to very varying conditions; hence, its introduction and acclimatization in so many countries; the barriers, opposed to its spread, appear to be chiefly those connected with temperature; as has been shown there are good grounds for believing that, there are no such barriers to prevent the spread of the Carolina plant to all the paddy-producing areas of this Presidency.

No climatical barrier to prevent extension of Carolina paddy cultivation over the Plains of this Presidency.

63. Experience, in attempting the naturalizing of other plants, has shown that even when the climate has been favorable, the newly-introduced plants are at first never so robust and vigorous as similar plants are in the country from which the introduction was made or, as such plants become after being thoroughly established in their new home. While undergoing naturalization, plants suffer much more severely, than they afterwards do, from irregularities in culture, or, weather. When the rice crop failed in Italy, in 1829, fresh seed was obtained from Carolina but, it was many years before the new variety of paddy adapted itself to the soil and climate. There can be no doubt, but that much greater and more continued efforts, than have yet been made, are requisite to secure the naturalization of Carolina paddy in this Presidency.

64. In dealing with the Ryots, few persons appreciate the difficulties that have to be overcome, in introducing a new crop. On this subject, the following extract is well worth attention; it is from Sir Henry S. Maine's recent work, "Village Communities," at page 103;—

Superstition and ignorance prevent progress.

"Of late years it (the British Government) has done its utmost to extend and improve the cultivation of one great staple, cotton, amid difficulties which seemed to be very imperfectly understood by those who suppose that in order to obtain the sowing of a new crop in a new way, from a peasant in bondage to hereditary custom, it is enough to prove to him that it is very likely to be profitable." All who have made any attempts in this country in this direction, will agree with Sir Henry Maine, that much more requires to be done to induce the Ryot to cultivate a new crop or, adopt some other system of culture, than merely to prove that profit will result therefrom.

65. If, as there is every reason to believe, the Carolina paddy originated from seed imported into America from Madagascar, it would be better in many respects to go to Madagascar for fresh seed for India rather than to America. In the Appendix will be found a letter referring to the rice of Madagascar.

66. But, even if every success was to attend the efforts to produce in this country a sample of paddy equal, in every respect, to that grown in South Carolina, there would yet remain a great deal to be done, before the rice prepared from it could successfully compete in Europe, with the Carolina rice of America. The high price of Carolina rice is due, to a considerable extent, to the very complete preparation it undergoes for the market.

Great improvement would be necessary in the preparation of rice.

(Signed) WILLIAM R. ROBERTSON, M.R.A.C.,
Superintendent of Government Farms.

NOTES ON CAROLINA PADDY IN AMERICA.

1. When engaged in drawing up the foregoing Report I had frequent occasion to inquire regarding the habits, and mode of culture, of the Carolina paddy plant, in America. In my search, for information, I found it necessary to consult many American Publications almost unknown in this country, or in England. I consulted, with much benefit, a number of the Agricultural Newspapers of the Southern States, and, the Annual Reports of the Commissioner for Agriculture who, very kindly, furnished me with a number. I have put together much of the information thus collected, in the hope, that it will be of use to future Experimenters with Carolina paddy:—

History and Peculiarities of the Crop.

2. There is much uncertainty, as to the time when paddy was first introduced into the United States and, as regards the country from which the first seed was obtained. The most reliable accounts show that the crop was first grown some time about the middle of the 17th century. It is asserted by some authorities that the first crop raised was produced from East Indian seed while, other authorities assert equally as positively that Madagascar seed produced the first crop. Seed from India and Madagascar certainly appears to have been introduced; and, the evidence tends to show that the Madagascar seed was introduced some time after that obtained from East India. As it is highly probable that Madagascar received the paddy crop from India, the Carolina paddy of America, may, after all, be descended from Indian paddy.

When first introduced.

3. Madagascar possesses a variety of paddy which resembles in many respects Carolina paddy. It is known in Madagascar as Rojofotsy. The grain is larger than that of ordinary Carolina paddy and, the rice obtained from it is nearly as white. It is possible that this paddy, may have been the variety introduced into America from which the Carolina paddy has descended. The color of the husk, is certainly not that golden color which characterizes the Carolina paddy but, it is quite possible that the color may have become gradually darker from the conditions the plant has met with in its new home.

4. The first seed appears to have been a white-chaff variety, similar in general appearance to that usually grown in America on uplands. This white-chaff grain for many years was, apparently, the only variety of paddy grown

White-chaff grain.

5. The gold-seeded grain, so called from its rich golden color, is now, the ordinary Carolina paddy of commerce. It was brought into notice some time before the Revolutionary War. From its superior quality its cultivation rapidly spread over all the paddy-producing regions. Its origin, is unknown, some say that it is descended from Madagascar seed which, they say, possessed qualities similar to those which distinguish this variety of paddy, but others, assert that its qualities are altogether of a superior grade to those possessed by the imported paddy, whether from India or Madagascar, and they, attribute its present excellences to *careful culture on good soils.*

Gold-seeded grain.

6. There are two well-distinguished varieties of gold-seed paddy, the long-grain, and, the variety noticed in the previous paragraph. The long-grain is a very valuable variety, but its cultivation is on a very limited scale, from superior soils and high cultivation being necessary for its successful culture. This variety is supposed to

of the seedling plants, for a fortnight, the water being changed whenever necessary; this irrigation is called the "stretch flow," because of the tendency it has to lengthen the blades of the young seedlings. This watering is very beneficial in killing down any grass which may have appeared in the crop. At the end of the fortnight in question, the water is drained off, and the land remains dry for about from 4 to 5 weeks, at the expiration of which time the plants usually begin to throw up their ear sheaths. During this long period of "dry culture" the land is thoroughly hoed and cleaned. The third irrigation called the "harvest flow" is next applied and the land is kept under water, until a few days before the harvest commences, the water being frequently changed, in the interval.

18. Another practice is, to water the newly-sown land for 4 or 5 days and then to leave it dry until the seedlings are about 4 inches in height. After the plants have reached this stage, the irrigation water is again admitted over the ground for a period of a fortnight, after the expiration of which time the water is withdrawn and the land is left dry for 6 weeks, being frequently hoed in the interval. At the end of the 6 weeks, the plants being then about 14 weeks old, water is again admitted over the ground and as in the practices already described, it is kept on the land with frequent changes until the crop is ready for cutting. There are several other minor differences in the management of the irrigation water; the great aim is, to keep down the weeds, and to preserve the land in a healthy state; lengthened floodings, being intended to kill down the grass, quick drainage to cleanse the surface of the land; and, frequent dryings to restore the capillary acti of the soil, to afford facilities for its culture and weeding.

19. The flowering season of rice plant is usually in August. Should the weather be stormy in this month t anxieties of the rice planter are very great, for, stormy weather in the flowering se reduces the yield of the crop very seriously.

Harvesting.

20. The crop is usually ready for harvest about 5 months after the date of sowing; September is thus the usual harvest month. The crop is cut before being quite ripe; usually, when the lower grains are hard; it is cut by means of the sickle or the reaping-machine but, generally, by the former. It is usual to tie the crop in sheaves which are stooked in the field for a few days. When ready for stacking, the crop is boated to the stack-yard. Great care is taken in stacking, lest there should be too much heat in the stack and the grain become discolored; a little heat is considered rather an advantage, as it gives the grain a rich yellow appearance. Threshing is performed by ordinary threshing machines driven by steam. Some of these machines are very large and are capable of threshing as much as 1,000 bushels of grain per day.

21. The yield, is generally from 40 to 60 bushels of grain per acre, weighing about 45 lbs. per bushel. The straw is usually from 4 to 5 feet in length and from 2 to 3 tons, per acre, and is much valued for feeding stock.

The yield.

Preparation for the Market.

22. The paddy is husked in different ways, sometimes by ordinary horizontal mill-stones and by large iron-shod pestles working in wooden mortars. Usually, the paddy is subjected to both the mill and the mortar processes in undergoing conversion into rice, the outer husk being removed by the mill and the inner cuticle by the mortar. After leaving the mill, or mortar, the broken rice, husks, dust, &c., are separated from the rice which is then sized and polished under an elaborate arrangement; the market-value of the produce depends greatly upon the skill with which the rice has been treat while undergoing thes g processes. The following extract will afford some idea of the intricacy of t ses, by which paddy is converted into rice in America;—

"The rough rice is first ground between very heavy stones, running at a high speed, which partially removes the rough integument, or half chaff. This chaff is passed out of the building by spouts, and the grain by similar means conveyed into the mortars; where it is beat or pounded for a certain length of time by the alternate rising and falling of very heavy pestles shod with iron. These are operated by a revolving cylinder of huge dimensions, armed with powerful levers, which, passing into a long opening in the pestle, about 15 feet in length, raise it in mid-air and let it fall suddenly into the great mortars below. From the mortars, elevators take the rice to the fans which separate the grain from the debris. From thence it goes through other fans that divide it into three qualities known as "whole," "middling," and "small rice." The grain is lastly passed through a polishing screen, lined with gauge wire and sheep-skins, which revolving vertically at the greatest possible velocity embellishes it with that pearly whiteness in which it appears in commerce.

"From the screen it falls immediately below into a tierce, which is kept slowly rotating, and struck on two sides with heavy hammers, all the time it is being filled, for the purpose of obtaining its greatest capacity. The tierce, as soon as full, is removed and coopered ready for market. The cost of such a mill was $1,000 per pestle —50 pestles being considered a good market mill."

23. The planter, sometimes decorticates the paddy and sends the clean rice into the market, but usually, the process is perfo ed in large mills owned by persons exclusively engaged in the trade. The hu king and finishing processes are also performed for hire, but, more frequently the mill-owner purchases the paddy. In New Orleans one cent. per pound is charged for husking and polishing rice of the first quality; for lower qualities the charge is usually about half a cent. for each pound of rice cleaned. A bushel of paddy of 45 lbs. will yield about 29 lbs. of clean rice.

Before the material for the foregoing
Dr. Forbes Watson, M.A., M.D., &c., Director
the Carolina paddy seed used in the Madras
give, regarding the peculiarities of the cultur
of America. He was good enough to comm
in the rice-producing regions of the Souther
disposal the following very valuable extr
information afforded is very clear and pract
gone over as in "the Notes" just given, it
should appear here in full, because the f
collected from other sources, and they affor
at the disposal of those engaged in naturalizi
These "extracts," are from a letter, dated
are as follows:—

"There are only two varieties of rice a
Gold and the White; of these the Gold is
in the proportion of more than 6 to 1, the wh
of shedding more readily when ripe and
the waste is much greater than with the
seed known as bearded rice somewhat res
Coast planters as the sample is inferior.

s was all collected, I had applied to
ie India Museum, who had procured
iments, for any information he could
Carolina paddy in the Southern States
e with some Correspondents residing
s, and has been able, to place at my
om a letter received in reply. The
I though much the same ground is
ighly desirable that "the extracts"
y give corroborate the information
nation which has not hitherto been
Carolina paddy plant in this country.
Carolina, 28th of January 1876, and

nt generally cultivated, namely, the
he most extensively used, probably
ce laboring under the disadvantage
sequently in case of a wet harvest
r. There is also a variety of white
ling wheat, but it is not used by the
red rice is what is commonly called

have been established by the careful culture, during a series of years, of the seed descended from an unusually fine ear with long grain, accidentally discovered in a crop of the ordinary variety. The rice of the long grain commands a higher price than the best qualities of the ordinary rice, but there is only a limited demand for it.

7. There are now several varieties of paddy cultivated in America; most of them are aquatic in their habits. Some, from long usage, have become suited for upland or dry tillage. It is universally admitted, that all the finest varieties need *particular care* during cultivation.

Land usually cropped with Paddy, and method of preparing it for cropping.

8. The land that has usually been found best adapted for paddy, is generally situated on the banks of tidal rivers. Such land is usually alluvial. As *thorough drainage* is deemed as essential as, a command of irrigation water, for the successful culture of the paddy crop, efforts are usually made to secure a site for a plantation where the tide, in the adjacent river, has a rise and fall of not less than 3 feet, generally, from 6 to 8 feet is considered preferable. As, salt water is so pernicious to the crop, paddy culture is generally confined to land situated above the place where the salt and fresh water meet in the river. From the rise and fall of the tides the irrigation and drainage of the land are almost under perfect control.

Thorough drainage as essential as irrigation.

9. Adjacent to all the great rivers, in the Southern States, there are vast areas of marshy alluvial land, which will probably eventually be reclaimed and utilized for producing paddy, recent experience having shown, that with the aid of steam pumps and suitable engineering arrangements, such land can be reclaimed and cultivated with profit. As yet, the crop is confined chiefly to land on which the natural irrigation and drainage facilities before mentioned can be secured.

10. The production of paddy, received such a very serious check during the late war, that the Americans were compelled at one time to become large importers of rice. During the last year or two however, there has been a very large increase in the area cropped with paddy, and the production of rice is now almost as great as ever. It is worthy of note that, a large tract of country formerly under rice plantations is now lying abandoned, from the soil having become too sour to yield a healthy, crop, the result of the neglect of drainage during and immediately after the war.

Soil injured by neglect of drainage.

11. In-land swamps, that are capable of being drained, are also, when irrigation water is available, used for growing paddy, but the profits attending such cultivation are never so great, as those obtained from the cultivation of the river-side land.

12. When these river-side swamps are being reclaimed, the first step is to protect them from being flooded by the adjacent river, this is effected by raising large embankments not only along the river boundary of the land but, around the whole of it, where there is a probability of flood-water flowing. The land that is to form the plantation, is next divided by smaller embankments into fields of from 10 to 20 acres in extent, skirting each of these banks, on the inner side, are open drains, of about 4 feet in depth, which communicate with the large main drain or channel, afterwards to be noticed. A flood-gate, or sluice, is provided for each of these fields, so that each can be watered, or drained, as circumstances demand. These fields, are again sub-divided by open ditches communicating with the side drains; thus, the field is cut up into beds of from 20 to 30 feet in width, each of which is made as level as possible. The main drain, or channel, is generally cut through the centre of the plantation; it is about from 4 to 5 feet in depth and from 20 to 30 feet in width. This channel, or drain, is used for introducing the irrigation water at high tide, and for draining off water at low tide being in connection with the adjacent river, sluices or flood-gates being provided at its junction with the river for the entrance, or escape, of the water. The channel is also used for navigation purposes; the large flat-bottomed harvest boats used on the plantations.

Reclamation of land for Paddy Culture.

Cultivation of the Crop.

13. In preparing paddy land for a crop, if the soil is known, or suspected, to be infested with an inferior kind of paddy known to the planters as volunteer paddy, it is usual first to plough to a moderate depth and to water lightly, at intervals during one or two months. This is done to cause the seed, that may be in the soil, to germinate and produce plants, the plants being afterwards killed by being ploughed down. This volunteer paddy is a most troublesome pest on the paddy plantations in America. When growing, it cannot be detected from the plants of the crop. It comes into ear sooner than any other variety of paddy, and as it sheds its grains immediately they begin to ripen, it is exceedingly difficult to avoid having the land seeded again.

Method of destroying Volunteer Paddy.

14. The first ploughing, in preparing the soil for the crop, is usually performed some time in December. Occasionally, a light covering of water is run over the newly-ploughed land in view to the furrow slice becoming thoroughly frozen, experience having shown that the pulverization produced by the thawing of the frozen soil, is much more perfect than that done by tillage implements. About the end of March, a harrow or a cultivator is passed over the furrow slices, or such portions of them as the frost has not fully acted on. The next operation is, usually, to raise the soil in ridges, which is done by means of large hoes; the ridges are, generally, from 12 to 15 inches apart, that is, from centre to centre. Occasionally, the land is dug over by means of hoes, instead of it being ploughed. Some planters consider digging in this way preferable to ploughing but, of late the practice has gradually fallen into disuse from the great increase in the price of labor in the Southern States.

15. Until recently, manure was very seldom used in paddy cultivation, the silt brought down by the rivers being considered a sufficient manuring; but now, it is largely applied on all the best-managed plantations. The use of manure necessitates much greater care in applying the irrigation water but, when a sufficiency of manure is used, a less quantity of water suffices. The husks, which are rich in mineral matters, the straw of paddy, the mill dust and other refuse of rice-mills, are largely used for manuring paddy land. A considerable quantity of the meal of the cotton seed, is also used for the same purpose. When manure is applied, it is usual to spread it over the land previous to the first ploughing and to plough it in. Occasionally, when the character of the manure admits of this, it is broadcasted over the ground as a top-dressing and is hoed into the soil. It has everywhere been found that manure, when selected and applied with judgment, produces a very marked improvement in the yield and in the quality of the grain.

Manure found to be necessary.

16. The seed is sown in different ways, sometimes, it is broadcasted and, at other times, it is drilled over the levelled surface of the ground, but usually it is sown in the furrows between the ridges before described. The quantity of seed sown, varies from 1 to 2 bushels, per acre. The weight of the seed varies from 44 to 45 lbs. per bushel. Sowing usually takes place in the first or second week in April. Great trouble is taken to secure a frequent change of seed, as it has been found that the grain deteriorates when produced year after year from the same seed. It does not appear to be the practice anywhere in the rice districts of the United States, to raise seedlings in nursery beds for transplanting into the field, as is the custom of treating indigenous paddy, in so many parts of the Madras Presidency.

Frequent change of seed necessary.

17. There is a great diversity in the irrigation practice of the rice planters of the Southern States. Usually, it is the practice to irrigate the land immediately after it is sown and to keep it under water for 4 or 5 days or until the grain has sprouted after which, the water is withdrawn, if not absorbed by the ground. This irrigation is technically termed the "sprout flow." During the following month, the land is left dry, or only slightly moistened, weeding being done when necessary. In the fifth week, irrigation water is again applied, and it is kept on the land, to within an inch or two of the top

Management of the irrigation water.

Volunteer, from the fact that it puts in an appearance when it is not wanted, or in other words, it seeds itself from year to year. It is caused by the shedding of rice during the harvest and after being exposed to the action of the air and Winter rains it is ploughed in and germinates with the new crop, ripening a few days in advance, it drops its seed upon the ground whence it springs up again with the following crop. In each successive year it acquires a darker red color and the land eventually becomes so polluted with it that a change of culture is necessary to eradicate it. The peculiarity of the Volunteer is that it is impossible to harvest it in any quantity, for it sheds its seeds as it ripens, and when it is abundant, being the stronger plant, it chokes out the crop rice. Fields have been known where at least fifty bushels of rice have been matured to the acre, to yield the planter less than twenty on account of the shedding of the Volunteers.

"It is the great curse of the planter and is more dreaded than grass as it is not to be distinguished from the crop rice until harvest time. The hull of this rice is generally white and there is more or less of it in all seed, it being impossible to procure seed perfectly free in any quantity.

"The value of seed depends in a great measure upon the percentage of Volunteer, that having the least quantity being of course the most valuable. The size of the grain depends upon the culture of the fields. There is no upland culture of rice of any consequence. Many of the upland planters however sow a few acres of swampy or wet land in rice for home consumption, but the amount sent to market is inconsiderable and of very inferior quality. There is a tradition that the first rice seed was sent from England to a gentleman of Charleston enclosed in an envelope and was by him cultivated in his garden the seed produced being distributed among his friends, at first it was cultivated by draining ponds and marshy land but after two or three years it was found that grass took possession of the land *on account of the want of drainage* and it had to be abandoned afterwards large backwater reservoirs were formed and the low lands lying in front were ditched and drained; this improved the sample of the grain and some few of the best of these places are still in use. It was then found that the marshes lying near the mouth of large fresh w rivers, *where the rise and fall, or pitch, of the tides were sufficient for purposes of irri and drainage*, were best suited to the culture of rice, the lands were reclaimed by g, and that portion lying immediately, on the river was divided into squares, or field ying in size from twelve to forty acres, according to the level of the ground. Cre oms were filled up and the high portions taken off to bring the land in each as nearly on a level as possible, in these squares trunks were placed with sh both sides, to serve for either irrigation or drainage, the level of the trunk w water mark which, was found on this river to give a *drainage of five feet* e of spring tides being seven feet four inches enabled the planter to flow to a depth of two feet if he desired it, each of these squares was surrou bank, and a ditch five feet in depth and about the same in width was cut round the square, this ditch is called a face ditch; the square was then to beds of fifty feet in width between which were cut what are called ars three feet deep and about eighteen inches wide, running from face di ditch, each field being surrounded by banks could be flowed independent ther squares and the trunk enabled the planter to hold the water at any r el.

"The amount of land conti the river being insufficient and the extent of tide lands limited, it was essary to clear the swamps further back, lying at the same level as the river was effected by cutting canals connected with the river by flood gates, wh opened on the rising tide would furnish sufficient water to irrigate the amo d required, squares were laid out on each side of the canal in the manner de fore, every square having its own trunk which enabled the planter to flow eeping any other parts of the plantation dry, some places run back from th miles through this system of canals. It was found that *the thorough draina* lity to flow at the option of the planter enabled him to keep down the gr great enemy of the growing crop and to depend with nearly absolute cert on the product, the water-supply being

unlimited and no loss has ever been sustained except from September gales, which do not occur sufficiently violent to cause a total loss more than once in fifty years.

"The lands themselves are inexhaustible and *the deposit from the river water with which they are irrigated possesses great fertilizing properties.* It is improbable, however, that these lands would ever have been reclaimed from the river without slave labor as the task would have been too expensive and too onerous for white labor besides the liability to malarial fevers and it is doubtful whether the freed man could ever have been induced to undertake it.

"Rice is planted from March to June the ditches having been cleared and the lands ploughed and harrowed, it is sown in trenches or drills fifteen inches apart and from two to three bushels of seed are used to the acre according to the fancy of the planter.

"After being sown and covered, the fields are flooded until the rice has sprouted, the time of which will vary with the weather from three to ten days.

"This flow which is called the sprout water, is then drawn off and the land kept dry until the seed has rooted and the plant made its appearance above ground, as soon as the rice can be seen for some distance in the trenches or rows, the second water which is called the stretch flow, is put on and held very deep for three or four days until the blade of the rice is stretched from four to six inches, it is then slacked off and held very shallow from twenty to thirty days, by which time the rice has become hardy and attained a vigorous growth, after which the squares are again dried and the hoes put in to break up the alleys between the rows and eradicate the grass; the rice now gets what is called the dry growth and is kept perfectly dry for a month or six weeks during which it is worked one, two, or three times, and all weeds and grass carefully picked out, on these workings the crop in a great measure depends, as soon as the stalk joints the lands are again flooded, and the water is held until the grain ripens, this is called the harvest flow, and is held about two months, when the water is drawn off, the rice is ready for the sickle and is cut and stacked in the fields, until it is brought to the thresher which is done by means of flats in the canals above mentioned. The quality and size of grain, depends upon the care exercised in the preparation and culture of the land, but more particularly upon *thorough drainage* which enables the plant to put out *deep roots* and to become strong and hardy during the dry growth, this necessitates great expense in cleansing all the ditches every year, and in keeping the trunks and floodgates in repair. After the late war the plantations having been abandoned, devastated by the enemy, the ditches had become filled up and consequently the land was sour, and it was several years before the planters could produce as good a sample as had been made previously, but by close cultivation the quality of the grain has improved year by year until now it is fully equal to any produced before the war."

(Signed) WIL R. ROBERTSON, M.R.A.C.,
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29th September 1877.

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29th September 1877.

CORRESPONDENCE, FINANCES, ESTABLISHMENT, &c.

Correspondence, &c.—The correspondence of the Department continues to increase; as this increase is due chiefly to more frequent communications with persons engaged in the management of land, it affords grounds for satisfaction. Advice has been sought on many subjects connected with agricultural improvement, and we, have been favored with useful information by several correspondents. The following, are some of the subjects on which advice, or information, was given in the past year;—

Increase in the correspondence of the Department.

Subjects.	District from which the applications came.
Manural uses of Animal Charcoal	Madras.
Lime as a manure on Coffee land	Mysore.
Cotton culture	Coorg.
The cultivation of Sorghum	Salem.
Fodder crops	Trichinopoly.
The choice of Implements and Tools for a Zemindary Farm	Tinnevelly.
Coffee cultivation, Soils, Climate, &c.	Bellary.
The culture of "the Planter's Friend"	Travancore.
Cholum, as a fodder-crop, and the merits of other indigenous fodder-crops.	Central Provinces.
Proposed purchase of a Threshing machine and a Reaping machine	Tanjore.
Feeding Horses on Guinea-grass fodder	Madras.
The culture and curing of Tobacco	Pondicherry.
The value of Slaughter-house refuse as manure; and, the means by which it could be converted into a portable manure.	Madras.
Cultivation of Guinea grass	Travancore.
Wheat cultivation	Chingleput.
The treatment of a stiff black soil, difficult to prepare for a crop	Cuddapah.
Cultivation of Sorghum	North Arcot.
Culture and treatment of Corakapilly hedges	North-West Provinces.
The "Double Mhote" as a water-lift for general use	Mysore.
Preparation of Gram for horses	Madras.
The preparation of Hay from Guinea grass	Trichinopoly.
The management of Milch cattle	Madras.
The utilization of the refuse bone charcoal Sugar Refineries	Wynaad.
Management of Paddy land	Mysore.
Saltpetre as a manure for Coffee shrubs	Wynaad.

2. As usual, a large correspon was conducted with the Board of Revenue. In addition to letters on the ordi siness of the Department, the Board were addressed on the following subjec

Grass experiment in the A istrict.—Submitting remarks on —. Board's Proceedings, No. 132 20th May 1876.
Sorghum Saccharatum ater's Friend.—Suggestions regarding the distribution of the sec Board's Proceedings, No. 1109, dated 26th April 1876.
District Farm, Coimbat port on a site for—at Othikkalmandapum. Board's Proceedings, 5, dated 4th May 1876.
District Farm, Coimbato port on a site for—near the town of Coimbatore. Board's Proceo o. 1178, dated 4th May 1876.
Commissariat Slaughter- Proposals for adapting for use as cattle-yards —. Board's P gs, No. 1402, dated 29th May 1876.
Prickly Comfrey.—Rem roposals to introduce —. Board's Proceedings, Miscellaneous N , dated 13th June 1876.
Tobacco Seed.—Proposal aining for distribution —. Board's Proceedings, Miscellaneous N dated the 7th of July 1876.
Decrease of the Gras f the Coimbatore District.—Remarks on —. Board's Proceedings, 4, dated 2nd December 1876.
Wind Engine for rur er.—Report on —. Board's Proceedings, No. 1768, dated the July 1876.
Agricultural College.— ng a list of text-books to be used in —. Board's Proceedings, 1, dated the 2nd of August 1876.

Distribution of Agricultural Seeds.—Proposals —. Board's Proceedings, No. 2082, dated the 16th of August 1876.
Subterranean water; Proposals to utilize—in the Tinnevelly District.—Remarks on —. Board's Proceedings, No. 2112, dated the 18th of August 1876.
Zemindary Farm proposed in Tinnevelly.—Suggestions for establishment of —. Board's Proceedings, No. 2244, dated the 1st of September 1876.
Subsoil drainage experiment.—Report on —. Board's Proceedings, No. 3081, dated the 6th of December 1876.

3. FINANCES—*Balances.*—The balance in favor of the department at the beginning of the year was Rupees 2,09,344-8-6.

Receipts.

4. The receipts in the year amounted to Rupees 96,806-12-1 against Rupees 94,933-9-6 in the previous year. These receipts were obtained from the following sources:—Surplus Pound Funds Rupees 71,707-9-6; Provincial Funds Rupees 20,000, Sydapet Experimental Farm and Workshops Rupees 5,099-2-7. The income from the Surplus Pound Funds was Rupees 4,762-9-1 greater than last year; while, the income from the Sydapet Experimental Farm and Workshops was Rupees 2,889-6-6 less than last year, due partly to the large area of land put under grass for the cattle acclimatization experiment, and to the unfavorable character of the year.

Expenditure.

5. The total expenditure of the year was Rupees 49,819-11-6 against Rupees 56,722-12-9 in the previous year. The expenditure under the different headings was as follows;—

General Supervision.—The expenditure was Rupees 19,685-15-3 against Rupees 18,672-7-8 last year.
Sydapet Experimental Farm.—The expenditure was Rupees 12,517-10-6 against Rupees 13,125-8-8 in the previous year.
Implement Workshops.—The expenditure was Rupees 1,946-8-0 against Rupees 2,359-6-8 last year. The expenditure under this heading fluctuates with the demand for implements.
Educational (Apprentice Classes).—The expenditure was Rupees 1,356-4-8 against Rupees 2,354-11-9 last year; these classes having been abolished there will be no further expenditure under this heading.
Agricultural College.—The total expenditure incurred on account of this new Institution, during the few months it has been in existence, was Rupees 5,594-13-2.
Permanent Estate Improvements.—The total expenditure under this heading was Rupees 6,373-12-10, against Rupees 9,928-6-0 last year.
Other Charges.—These consist of transfers, made in the office of the Accountant-General, to adjust claims for purchases made in England through the Secretary of State, to pay the salary of an Inspecting Veterinary Surgeon and to meet claims in other departments, &c. These charges, amounted in all to Rupees 2,344-11-1 against Rupees 10,282-4-0 last year. The smaller expenditure is due to the appointment of Inspecting Veterinary Surgeon, having been vacant during the year.

6. There remained at the end of the year's balance, to the credit of the Department, amounting to Rupees 2,56,331-9-1.

7. The usual statement of income and expenditure appears in the Appendix.

8. *Establishment.*—Mr. Benson continued to have charge of the Sydapet Experimental Farm, and Mr. Schiffmayer had charge of the extensive Estate Improvements carried out during the year. Both gentlemen have afforded me much valuable aid. Mr. Schiffmayer's services will be available for carrying on a District Farm when they are so required. The Overseers, Clerks and ~~others have~~, generally, afforded satisfaction in the performance of their respective duties.

(Signed) W. R. ROBERTSON, M.R.A.C.,
Superintendent, Govt. Farms.

29th September 1877.

THE GROWTH OF FORAGE FOR LIVE STOCK WITH SOME REMARKS ON OUR FODDER PLANTS.

1. The discussion of the subject of this paper is weighted with many difficulties, owing to the branch of husbandry to which it relates being totally ignored in Southern India; this being the case it is necessary to show, first the reasons for the introduction of the industry, and then what might be done in it by the Native cultivator.

Introduction.

2. To preserve the life of their cattle, it is the habit of the ryot in many districts during the hot weather to drive them great distances in search of pasture; when he finds this pasture, probably on the slopes of some hills, in jungles and wastes, it is of a poor character, coarse, innutritious and indigestible; during the time that the stock are being depastured in this manner they are subjected to the ravages of beasts of prey, and the effects of exposure, and all their excretions are wasted as manure. The effects of this innutritious feeding are evident in the diminutive ill-formed cattle to be seen generally throughout the country.

Present custom of pasturing bad.

3. It is generally acknowledged, I believe, that the presence of an abundance of good agricultural stock in a country denotes agricultural wealth, and *vice versa*, and that, amongst this stock, live stock in the shape of cattle and sheep is the most important; even in Japan and China, which countries are commonly quoted as exceptions to the rule that live stock are highly valued agriculturally, it appears, from the reports of recent travellers, that the value set on them is great. The cultivating power there is in many respects very similar to that of this country; for the supposition that the cultivation is more than a spade-culture, a system which is not to be found in this Presidency to nearly all minimum extent, has been proved to be incorrect regarding the interior districts. The consumption of meat for human food in this country is considerable and in reality greater than is usually supposed.

Great value of Live Stock.

4. In Europe, America, Australia, and elsewhere, the growth of fodder for live stock is recognised as a most remunerative branch of husbandry. It has been proved by experience, that it is more economical to bring the food of an animal, which is either performing labor or being fattened, to it, than to let it wander in search of the means of existence. It is known that the excreta of animals are a most valuable source of plant food, and that to collect them (their waste being a suicidal proceeding) it is necessary to confine stock to a limited area in order to accomplish it satisfactorily and economically. When cattle are allowed to roam at will, mixing herd with herd, the spread of contagious and infectious diseases is encouraged and facilitated as is shown by the enormous mortality so often seen amongst the live stock of Southern India from this cause. I have said that fodder raising is a remunerative branch of agriculture; the profits from it are not to be immediately counted out in rupees, but in the larger supplies of organic manures, so much required in this famine-stricken land, in the greater number, the better health, the earlier maturity, fuller development, greater power, and stronger constitutions of the live stock.

Fodder raising profitable.

5. The old saying, that "the man who makes two blades of grass to grow where one grew before, is a benefactor of his country," is a summary of the ration of fodder raising. To keep two animals, sheep one animal equal to two of the deser formerly kept, on the same area, should be the end and object of the husbandman. The economy of growing food for live stock, generally speaking, close to their homestead must be evident—not indeed for the young stock because they have no labor to perform, but especially for the draught and milch cattle of the country. If animals have their food brought to them, or can obtain it without much exertion in being entailed on them, not having to exert any of their powers to carry them in search of it they are rested instead of fatigued whilst eating.

6. To improve a breed of cattle, it is an indispensable requisite that cattle, sires, dams, and offspring, should be well treated and properly fed; development depending

so much on the treatment and feeding of the animal. The necessity for the improvement of the cattle of this country is well known, and the economy of using powerful bullocks self-evident. On the roads and agriculturally, the want of good draught animals is a bar to economy of working. To the cultivator, the absence of good cattle prevents his adopting that practice essential to his well-being in this country—deep cultivation. To bring about this improvement better means of feeding cattle must be found, and they are to be found in the growth of forage crops.

7. The necessity of this branch of husbandry has been shown; to point out means easy of adoption for carrying it out must be my next endeavour.

Natural pasture.

There are many ways in which forage may be raised, chief and simplest amongst them is natural pasture. Natural pasture in this country is generally very poor, the native grasses being all without exception harsh, coarse, and wiry; even the much vaunted Hurriallee (*Cynodon Dactylon*) is tough enough to remind one of hempen rope; a sward of grass is seldom, if ever, to be seen; tussocky growth is the common habit of the natural pasture, and demonstrates the want of attention which is paid to it. The improvement of pasture lands by such operations as drainage, cultivation, manuring, seeding, &c., is never practised, even if it be known. Although, in some few localities, the supplies of fodder are plentiful from natural growth, there is no general distribution of grazing grounds, and what areas, specially devoted to this purpose there are, are annually being encroached upon by the extension of the arable lands. Under these circumstances the improvement, that is causing greater productiveness of the existing lands, must, if no habit of growing fodder crops is introduced, necessarily take place, or the cattle of the country will decrease in number and size; their number at present is so small and their frame so diminutive as to suggest extinction. The growth of natural pasture without the aid of water is a matter of difficult attainment under conditions such as appertain in Southern India, although it is doubtless possible to improve the existing pastures most materially by judicious husbandry.

Improvement imperative.

8. Failing natural pasture, artificial grasses could be resorted to, but there is a great dearth of knowledge of what grasses and herbage plants could be successfully grown, and the question of the possibility of growing such has never been investigated excepting to a slight extent.

9. One grass there is, which cultivated artificially yields good results, and it can be confidently recommended, to all who require such an one, as able to withstand the longest and most severe droughts without irrigation and springing into life with the first rain. It is the "Guinea grass," *Panicum Jumentorum*, an exotic, but perfectly acclimatized grass, which is most easily propagated by cuttings. Its culture is very simple, for if planted at the commencement of the rains, it soon strikes root and is then safe and out of danger for the future. If planted in rows it allows of interculture by cattle-power, by which means the land on which it grows may be easily cleaned, thus affording an excellent fallow crop; it will grow fairly on very poor lands; it cannot withstand the effects of stagnant water, but repays, although it does not require irrigation; half of the tussocks should be removed annually, and the crop should not be kept down too long, but alternated with others in rotation. No difficulty is experienced in removing it from the land so that it never appears as a weed. The fodder is produceable at the rate of Rupees 7 per ton and is of good quality.

Guinea grass is a good fodder and fallow crop for a rotation.

10. Hurriallee grass (*Cynodon Dactylon*), the Doob grass of Northern India, the Couch grass of Australia and America, is a valuable, but, I believe, overrated fodder plant, possessing great vitality and widespreading roots which are capable of propagating the grass from each section of them; it is suited to our long droughts and is also capable, under high cultivation and irrigation of producing heavy cuttings of tough wiry fodder, which however must possess considerable nutritive qualities; on poor soils it is liable to be crushed out by inferior types of plant, but on those of fair quality it is very persistent and hard to eradicate; the latter point is detrimental to its use as a crop to be taken in a rotation. The cost of producing a ton of Hurriallee grass is about Rupees 10, whilst in Madras one ton of hay which equals about three tons of green

Hurriallee grass very persistent and only useful in permanent pasture.

grass may be sold for Rupees 30—40. The growth of the grass might be encouraged on waste lands by manuring and seeding, but its cultivation can scarcely be recommended except near large centres of population, where there is a demand for such forage.

11. Passing from pasture, natural and artificial, I come to the next resort of the stock keeper—forage plants. If the indigenous and presently acclimatized exotic plants do not furnish an abundance of variety of pasture, it cannot be said that artificial forage crops are wanting. The ryot, who knows as little of raising special fodder crops as he does of the management of pasture, from his ignorance neglects the splendid, and unexcelled in more favored countries, sources of forage that are ready under his hand, which would enable him to produce food enough to feed far more and better stock than he has at present, and by this means to manure his lands better, thus making them capable of producing crops in seasons of drought and increasing their yield during ordinary ones.

Great abundance of artificial forage plants.

12. First, pre-eminent, stands the Sugar-cane (*saccharum officinarum*), an unrivalled producer of valuable, enticing, succulent fodder at a cheap rate. Occupying the ground about nine months only, it will produce over 100,000 lb. per acre, and not costing more than Rupees 2 per ton at the outside. Sugar-cane is an exhausting crop under the practice of growing it for external sale, but if grown as a fodder this objection to it would disappear, as the manure of the animals fed on it would contain the major portion of the valuable constituents of the soil, which it extracts during its growth. If given whole great waste would ensue with this fodder, but if chaffed the more succulent and the coarser portions becoming intimately mixed would all be consumed by stock. If the canes were used for the manufacture of sugar, the refuse, if chaffed and properly treated, could still be used for fodder.

Sugar-cane good source of fodder.

13. *Sorghum vulgare*, the great millet, (Tam.) Cholum, (Tel.) Jonna, (Hind.) Jowar, stands next amongst the many plants indigenous to this country which are most economical fodder-producers. This grass is largely cultivated as a grain producer in all parts of India, the straw thus grown is used as cattle food, but the growth of it as a fodder crop, to be cut when green and succulent, is unknown to but a very small extent; cultivated well the yellow variety produces at all times of the year heavy crops of fodder; naturally, it requires irrigation, if grown during the dry season, but all the water it receives it amply repay. Producing at a single cutting often from 10,000 to 15,000 lbs. per acre, it will yeld three or four cuttings and a total outturn of thirty to fifty thousand pounds at a cost of about Rupees 2 per ton. It will grow on most soils, even very poor ones, as is shown by its success on the Sydapet Farm; but, for growth to perfection at a cheap rate stronger soils, such as those found in Bellary and Cuddapah, denominated "black coton soils," are most suitable.

Yellow Cholum very valuable and easily grown fodder.

White Cholum in a great measure possesses the qualities of the yellow variety, to which it is closely allied and from which it differs chiefly in the color of the seed and the character of the paniole.

14. *Penicillaria spicata*, (Tam.) Cumboo, (Tel.) Sujjaloo, (Hind.) Bajree, is another indigenous plant, especially suited for cultivation, during a season of high temperature and light rainfall, on lands which it is not possible to irrigate. It is chiefly grown on the poorer classes of soils and does not produce very heavily. It grows well in some localities under irrgation, but does not come up to cholum either in productive powers or in the quality of the forage produced.

15. *Panicum Miliare*, (Tam.) Shanay, (Tel.) Samaloo, has been proved to produce as much as 47,000 lbs. of green fodder per acre with considerable supplies of water; the cost of production was under Rupees 2 per ton, and the fodder of fairly good quality but soft and watery. It yields two or three cuttings from one sowing.

16. *Oryza sativa*.—The country paddy may be grown profitably as a fodder crop, especially within short distance of large towns, and, in seasons of deficient rainfall, as the short supply of water although totally inadequate for the production of a grain crop, might mature a very profitable fodder crop. Paddy will produce from fifteen to twenty thousand pounds of green fodder, or four to five thousand pounds of hay at a cost of about Rupees 2-8-0 per ton for fodder, and Rupees 7-8-0 for the hay. On the rain-fed lands, so common in Chingleput district, the growth of such a crop

would, I have no doubt, prove far more remunerative to the ryot, than the results of his endeavours to produce a crop of grain.

17. *Eleusine corocana*, (Tam.) Kelvaragoo, (Tel.) Taindulu, (Hind.) Ragi, is a fair fodder producer, but yields grain also well under moderate irrigation.

18. Horse Gram, *Dolichos uniflorus*, (Tam.) Kolloo, (Tel.) Woolavaloo, (Hind.) Koolthee, is a valuable pulse crop for forage or green manure. It produces from two to four thousand pounds of fodder in two months, at a cost of about Rupees 3 per ton and thrives with a minimum rainfall in very hot weather. The ease with which it may be cultivated recommends it most highly as a catch crop for forage purposes, either to be grazed on the land or fed in the stalls.

19. The other pulse crops of the country, are useful but not to be specially recommended for the production of fodder, and in this direction there is a want. The lack of a good leguminous plant which could be mixed with grasses in forming a pasture will be felt when that branch of husbandry is taken up; the small amount of, if any, research in the direction of improvement of pastures, &c., in this country has arisen simply from the want of good Agricultural Botanists, who would devote their time to the investigation of the comparatively uninteresting division of graminacious and other agriculturally important orders of plants. There are probably existing in other countries, grasses, legumes, and other pasture plants which might be acclimatized in this country; the study of such an extensive branch of husbandry will be a great work.

Deficiency of leguminous forage plants.

20. *Sorghum saccharatum*.—Of the exotic crops, which have been most successfully cultivated in this country, foremost stands the Chinese Sugar-cane, and the sub-varieties of the same plant—"Planters Friend" and "Imphee"—closely allied to our cholum, flourishing under the same conditions, it possesses several advantages over that crop; the succulence and richness in saccharine matters of the straw; the ease with which it rattoons, and the consequent possibility of raising more than one cutting from one sowing, which habit although possessed by the cholum, is more marked and perfect in this crop. The possibility of producing a crop of green fodder as well as seed is characteristic of the plant. The crop is scarcely able as yet to withstand the heats of the plains, but in the cold weather will produce from 15,000 to 20,000 pounds of straw per acre, besides 1,000 to 1,500 pounds of grain at a single cutting.

Very valuable and enticing fodder.

21. Maize, (*Zea mays*), (Tam.) Mukha Cholum, (Tel.) Moka Jonna, (Hind.) Mukha Jowari, is not really an exotic crop, for there are depraved varieties of it to be found growing on limited areas in various parts of the country; but, when speaking of maize, I refer more particularly to American and Australian varieties. Maize flourishes wherever cholum will grow well; requiring however a deeper soil, more organic manure and better cultivation. Grown for seed, it produces an enormous amount of nutritious grain; if cultivated for fodder, the forage produced is of very high value. In quantity it will equal the yellow cholum, but is rather more costly.

22. Lucerne (*Medicago sativa*) has been successfully grown and produces a valuable fodder, but the price of it has as yet not been determined. It can be kept on the land for a considerable length of time (three or four years) and will leave it in a better condition for growing cereals than before.

23. In conclusion, there is, I have shown, no want of suitable fodder-producing plants amongst those grown commonly by the South India cultivator, but he does not make use of the opportunities before him nor avail himself of the gifts that are given him. The importance of the industry is great, and the sooner it is introduced the more advantageous to the country. Until it is introduced we cannot hope for the development of powerful breeds of cattle wherewith it will be possible to improve economically the cultivation pursued in one of its greatest failings; and with its introduction we may hope to see, what is not seen now—a marked increase of the number of cattle supported by an acre of arable land. The power to perform deep culture, and the manure wherewith to grow good crops are both required; neither of those will be attained without larger and better supplies of fodder than at present exist.

(Signed) CHARLES BENSON, M.R.A.C.

SYDAPET,
14th September 1877.

The waste of potash has been shown to be 92,000 tons, and none or very little of this need be lost, if proper means of preserving it were adopted; valuing it at Rupees 150 * per ton the total waste amounts to Rupees 1,38,00,000.

Annual loss to country.

Collating the figures given above I find that the total loss to the country annually is much as follows:—

	Rs.
Organic matters worth	66,30,000
Ammonia	3,85,00,000
Potash	1,38,00,000
Total ..	5,89,30,000

12. Some persons have asserted that the practice, already alluded to, of collecting so much of the dung which would otherwise be lost, recompenses, the manure heap for the robbery it is subjected to, by means of the increased amount of ashes that are brought to it. Whether the ashes of the fuel of the people are ever returned to the soil to any considerable extent is a most doubtful matter, so that, leaving out of the question the loss of organic manure, and the fact that, if cattle dung were not used as fuel, wood † or some other substances leaving ashes would be, the practice is of questionable importance.

Ashes of day collections.

13. I have already estimated the solid excrements of cattle to amount per head annually to 8,000 lbs., assuming that seven-eighths of this amount is collected and made into bratties for fuel, and that four-sevenths of the collections are made at night from the excretions of the animals whilst they are penned, the following figures represent the total of wet dung collected in this Presidency;

Total collections of faces.

From cattle at night	11,160,000 tons.
Do. during day	8,370,000 „
Total ..	19,530,000 „

Of this mass about 2·5 per cent. are mineral matters, which thus amount to 488,250 tons. The valuable portions of the ash are chiefly Lime, Magnesia, Potash, and *Phosphoric acid*, existing in the proportion of about 10, 2, 1, and 7 per cent., respectively. The amount collected of each of these constituents is therefore about;

—	At Night.	By Day.
Lime	27,900 tons.	20,900 tons.
Magnesia	5,600 „	4,200 „
Potash	2,800 „	2,100 „
Phosphoric acid	19,500 „	14,700 „

14. The ash of the day collections are, I have already said, supposed by some to repay the losses caused by using the cattle dung for fuel; valuing these ashes at the following rates;

	Rs.
Lime	15 per ton.
Magnesia	12 „
Potash	150 „
Phosphoric Acid ‡	200 „

and supposing that all of the ashes are returned to the soil the account may be shown to be nearly as follows,

Loss.		*Gain.*	
Organic matter. Ammonia. Potash.	Rs. 5,89,30,000.	Ash of day collections.	Rs. 36,18,900.
		Actual losses	Rs. 5,53,11,100.

* The ashes of wood contain from 5 to 20 per cent. of Phosphoric acid besides about 10 to 15 per cent. of Potash.

† Mr. J. B. Lawes, F.R.S., values Phosphoric acid £29·10 in England.

‡ *Note.*—These are taken from some figures compiled by Dr. Forbes Watson. The accuracy of the figures or their applicability to ordinary grains cannot be vouched for. Probably the samples they refer to were selected especially for their quality. No really reliable analyses of the ordinary food-grains of the country exist.

Thus, under the most favorable circumstances, when all the ashes are carefully collected and returned to the land, the loss from this system in this Presidency alone amounts annually to nearly 5 million pounds sterling. But, considering that at a favorable estimate at least one-half of all the ashes are never rendered available for plant food, the loss is nearer

Lime	3,500 tons.
Magnesia	700 „
Potash	350 „
Phosphoric acid	2,400 „

15. Leaving out the constituents of minor value, Lime and Magnesia, the total loss per annum in the Presidency of plant food from this practice is nearly as follows—

Ammonia	77,000 tons.
Potash	92,000 „
Phosphoric acid	2,400 „

of an aggregate value of about Rupees 5,27,80,000 *besides the organic matters*, the value of which, as I have already stated, it is most difficult to estimate, although it is well known that the deficiency of it in Indian soils is a point of incalculable detriment to their productive and drought-resisting powers.

16. There is another element which adds materially to the benefits of cattle dung as a source of manure, that is, the minutely divided state in which its constituents exist, and the consequent facility for its application to the land in a manner in which it is easily made use of by plants.

17. The importance of the three constituents which I have been referring to is shown clearly in the following table, giving the amount of each required in the formation of 1,000 tons of the following grains, respectively:—

—	Ammonia.	Phosphoric acid.	Potash.
Wheat	2·86	8·2	5·5
Maize	1·9	5·5	3·3
† Yellow Cholum (*Sorghum vulgare*) ..	1·48	8·56	2·07
Rice	1·15	1·7	·8
‡ Cumboo (*Penicillaria spicata*) ..	1·62	6·78	4·05
‡ Raggy (*Eleusine corocana*)	1·03	5·95	5·34
Maize straw	4·74	3·8	16·6

18. The figures given above, although they are probably often varied from considerably in different samples, are yet sufficiently accurate to serve as a type, and in looking at them it must be remembered that, although an excess of one constituent in the soil may slightly alter the relative quantities of other constituents taken up by a plant, the proximate composition is always nearly the same. The figures show a great demand for Phosphoric acid, and with reference to this want, the supplies of cattle dung are totally inadequate to supply a sufficient quantity of that substance; and the necessity of rendering every possible source of it available, for instilling into the intellects of the cultivators the urgent necessity for the use of bones, wood and cattle dung ashes, and night-soil as manures, and for the investigation of the question of the existence of phosphatic guanos, like those found in South Carolina, coprolities, apatite, or any other source of Phosphoric acid in this country is most evident.

Great want of Phosphoric acid.

19. It has been asserted by some authorities that "it is difficult to see whence a sufficiency of manure is to be procured" wherewith to manure the irrigated lands, in order that the water at present used may be economized. I have shown, if this pernicious habit were put a stop to, that at least 2,210,000 tons of dry organic matters would annually be rendered available as manure, an amount which would equal at least 3¼ million tons of manure (excluding litter), or a supply of ¾ ton per acre per annum to all

Organic manure sufficient to halve water required for paddy crop.

the paddy lands of the country of what they most require. If this manure were applied regularly for 12 years I venture to assert that half the present quantity of water used would suffice to raise heavier crops of paddy. Trees would have to be very extensively planted, if the use of cattle dung fuel were stopped and thus the supplies of leaf manure would be vastly and annually increased.

20. I have confined myself as yet to pointing out the pernicious effects of the habit, how it may be avoided should also be shown, as well as how it might be put a stop to. Cattle dung is apparently used as fuel for two reasons, firstly, because it is often seemingly cheaper to the consumer and perhaps more convenient; secondly, from habit, instilled into the ways of the people for many generations. The reason why it is cheaper than fire-wood is the want of that article, which want could be easily avoided by planting much of the inferior soils which now produce, if anything, only a very scanty and low class of pasturage, but which could easily be brought to grow trees; by this means the soils would be improved, the decaying leaves increasing the organic matter in them; and also as the roots of trees seek deeper down for their supplies of nourishment they would render a greater field available from which to draw plant food for the growth of our field crops. The practice pursued in Japan of causing three trees to be planted for every one felled is worth mention here.

Growth of trees improves soils.

21. The use of cattle dung fuel by any one for any purpose can be rendered unnecessary, and how to render it unnecessary is, in my opinion, a most important question; it can be rendered a luxury by adequate planting of fuel trees. To bring about this much-to-be-desired reform, something, more than the present encouragements held out to persons who plant trees, should be done; if it be impolitic to enforce the planting of portions of every village with fuel trees, which is doubtful, it cannot be to place a tax, on the cattle dung used as fuel, to be annually increased in amount as the chances of having supplies of fuel from other sources have been added to, time being allowed for the growth of trees. Toddy and arrack are taxed, why should not a habit, even more detrimental to the well-being of the country than the consumption of spirits, and which can be rendered greater luxury? The profits of such a tax would in a measure repay the interest of the outlay on the famines which are so much intensified by this habit. The price of fire-wood in Sydapet is about Rupees 7, and that of bratties about Rupees 17½ per ton; the reason for the use of bratties is explained by the fact that, the dung being collected by the females of the family, no disbursement is required to obtain a supply. Supposing that a tax of Rupees 2 per ton were imposed on their manufacture, an income, if the present rate of consumption continued, would accrue of over 90 lakhs of Rupees, an amount equal to the total excise and customs duties of this Presidency. Good fire-wood, equal in quality to that of the Casuarina, should be obtainable in ten years in all parts of the country at Rupees 5 per ton, which amount might be fixed as the ultimate rate for the bratty tax.

Cattle dung fuel should be rendered a luxury.

(Signed) CHARLES BENSON, M.R.A.C.

SYDAPET,
30*th August* 1877.

THE PHYSICAL* PROPERTIES OF THE SOIL AS INFLUENCED BY TILLAGE AND THE APPLICATION OF ORGANIC MANURE.

1. The soil must be regarded in a two-fold aspect; first with reference to its chemical composition, and secondly in respect to its physical properties. Few plants of any value, except the arboreous kinds, attain any degree of perfection in an uncultivated soil, since the soil in its natural state seldom possesses the chemical composition and physical properties, necessary for the production of cultivated crops.

2. In most instances, one or more of the elements essential to the vigorous growth of plants, are not to be found, or, if present, are either deficient in quantity, or exist in combinations, in which they cannot be absorbed, or that are injurious to the growth of plants; or, again, the physical condition of the soil is such as to render these elements altogether ineffective. The chief object that occupies the attention of the Agriculturist is the removal, or the diminution, of these defects of the soil, and this is effected by mechanical operations, by tillage, the application of manure, &c.

3. Whether the adoption of one or other of these means should receive the greatest amount of attention depends firstly, and chiefly, on the state of the soil; then, on the speciality of the crop to be raised, as well as on the possibility of realizing a return, equal to the sum spent on labor, &c., in the production of the crop; the ability of the cultivator, and other circumstances often most difficult to determine. Generally, the application of manure tends to supply one or more of the elements that constitute the food of the plant which may be deficient in quantity. Tillage tends to render the existing food, in inert chemical combinations, available for the plants as well as removes the injurious tendency of other chemical ingredients, it improves also the physical qualities of the soil, exterminates weeds, &c. But, manures are often applied for the purpose of improving the physical properties of the soil and as solvents for the inert chemical combinations. The first process, is nearly always accompanied with good effect, but the latter, if carried to excess, is apt to impair the fertility of the soil and may in the course of time render it unprofitable for future cultivation. There may be many cases where, even under high cultivation, an addition of manure would not increase the production of the crop, the soil being naturally so rich that without manure the highest possible produce is obtainable, but very rarely will it occur that without mechanical operations and proper tillage, a produce at all satisfactory will be obtained. A soil, judged by its chemical composition, may be deemed very fertile, yet in reality be unfit to produce anything, until its physical qualities are improved by proper tillage.

4. The conditions of fertility are very varied; the presence in the soil of the food of plants is important but, the physical properties of the soil frequently possesses a greater importance. To this, must chiefly be attributed the failures that resulted from too hasty conclusions, drawn from chemical analyses of soils, by certain enthusiastic admirers of chemistry, who believed, that the presence in the soil of those elements that constitute the plant food was sufficient to determine the question of its fertility. For the purpose of obtaining the highest possible produce, the soil is broken up by various tools and instruments, pulverized and made mellow, &c., so as to suit each special want.

5. The more the science of agriculture is advanced in a country, the more is recognized the importance of thorough tillage, which in such places has been extended even to forest land, especially since the value of forest conservation has come to be thoroughly understood and appreciated.

6. The most important result obtained by tilling the ground is, the improvement of the physical properties of the soil, because the chemical actions will only then have full play when the atmospheric air can freely circulate in the soil. The soil, considered generally, is an accumulation of fine molecules invisible to the eye, and

* In the last Annual Report (1875-76) will be found some valuable results obtained by Mr. Schiffmayer that afford much information regarding the physical properties of soils.

representing a fine powder or dust. This accumulation of fine particles, being the product of the complete disintegration of rocks, represents the essential part of the soil, and is mixed with grains of sand more or less large intermingled with fragments of rock. This pulverized mass with the less decomposed fragments of rocks constitutes the geognostic base of the soil, and from the occurrence of organic matter in the top-layer, we distinguish generally between surface and subsoil. The pulverized mass and the finely-distributed organic matter determine chiefly the physical properties of the soil.

7. If grains of soil, more or less round, lie together, they come in contact only in a few points, of their surface, between them are spaces or interstices. Even melted metal possesses these interstices between its molecules. In the soil, these interstices are of the utmost importance, because, if the circulation of air is not prevented, they are filled with air and determine the porosity of the soil. Every solid substance attracts gases and condenses them under certain conditions.

8. As attraction, is a function of the material's surface, it is evident that the effect of the attraction, depends on the area of the surface. The more pulverized a soil is, and the more pores it contains, the greater surface does its particles exhibit and, consequently the more gases can such a soil absorb. For this reason sand absorbs much less gas than clay, and a well-tilled and pulverized soil more than a soil roughly ploughed. Consequently a soil deeply tilled absorbs more than one that is shallow tilled. It has been ascertained that the lower the temperature of the soil, the greater is the absorption that takes place, and to this circumstance chiefly is attributed the beneficial effects that a low temperature produces on the soil, a fact with which every practical farmer in Europe is familiar. With regard to absorption of atmospheric air, it may be mentioned that oxygen and nitrogen are both absorbed by the soil, to a limited extent.

9. Although the attraction of oxygen is not intense, the readiness with which this gas enters into combination is the cause of a great amount of oxygen being absorbed. The particles of soil condense the oxygen on their surface and this entering into chemical combination with them oxydation takes place. By oxydation the free oxygen is removed and the particles of the soil are thereby enabled continually to absorb fresh oxygen. When the surface of the particles of soil is not oxydable, the absorption is only trifling. Most soils, however, are made up of constituents favoring the absorption of oxygen, especially such as contain inferior oxydes of iron and humus.

10. Protoxyd and other inferior combinations of iron are highly qualified to absorb oxygen, provided the circulation of atmospheric air is favored by frequent and deep tillage.

11. A soil possessing a large amount of iron as protoxyd in the subsoil, may, when this is brought suddenly to the surface, exhibit for a certain time indications of barrenness, but this is not on account of any obnoxious or poisonous quality of the combinations of iron, but must, chiefy, be attributed to the fact that all the oxygen of the air circulating in the soil is absorbed by the protoxyd to form higher combinations of iron, so that little or none is left available for the roots of the plants. It has been clearly shown that the roots of plants always keep up respiration. The plant is enabled to grow more rapidly and yield much more when there is an unlimited supply of free oxygen in the soil. An experiment made by Stockhardt demonstrates how much the yield of a crop depends on a liberal supply of atmospheric air. He filled two cylindrical glasses measuring 2·5 feet in height and 5·5 inches in diameter each, with soil. In each cylinder was sown five grains of oats and three of peas. One of the cylinders was perforated at the bottom which was brought in connection with a gasometer filled with atmospheric air. The vegetation period extended from 14th of June until the 3rd of October during which time the soil in the perforated cylinder received daily 1,000 cubic centimeter of atmospheric air from the gasometer, whilst the soil in the other cylinder could receive atmospheric air only from its surface. Besides this, both cylinders remained under equal conditions; the soil was a loamy sand containing much humus. The outturn on dry plant substance was as follows;—

Without additional supply of atmospheric air.	Grammes.
Five plants of oats	3·90
Three do. of peas	1·72
Roots of both	0·27
Total	5·89

With additional supply of atmospheric air.	Grammes.
Five plants of oats	7·65
Three do. of peas	2·46
Roots of both	0·38
Total	10·49

The soil receiving a liberal supply of atmospheric air produced twice as much as the other. The circulation of atmospheric air in the soil promotes in a special manner the development of the roots. Sohuhmacher found that barley plants, which he grew in a pot provided with a tube to conduct atmospheric air to their roots, had produced roots three times as heavy as other plants grown under the same conditions but not provided with a tube.

12. The need of oxygen for respiration varies very much in the different species of plants, but, as a rule, the more valuable species require more than the lower kinds. From this it is evident that it is impossible for the higher types of plants to thrive as long as they have but a limited supply of the element most essential to their growth. A soil containing much protoxyd of iron is therefore the most in need of frequent and deep tillage, in order that oxydation should take place in the shortest time to enable the roots to penetrate to a greater depth in order to come in contact with a greater amount of vegetable food and to meet the other conditions necessary for the healthy growth of the plant. In most cases with such a soil, especially in climates with little change of temperature, deep tillage should be gradually effected. To fallow the land for a certain period, frequently ploughing and stirring up the soil in the meantime, greatly promotes its disintegration. It has been ascertained that oxygen is but slightly absorbed by sand, gypsum, and calcareous earth, but largely by clay, and in the highest degree by humus. An experiment made by Herman gives some idea as to how the oxygen acts upon humus. He brought 28 volumes of wood that had commenced to rot under a bell-glass which contained 262 volumes of air. The wood remained under the globe for 10 days at a temperature of 27 degrees (Centigrade) after which time the volumes of air remained the same but the air contained less oxygen and more Carbonic Acid. The component parts of the air under this experiment may be exhibited as follows;—

Before the experiment.		*After the experiment.*	
Nitrogen	207 volumes.	Nitrogen	194 volumes.
Carbonic acid	*Nil.*	Carbonic acid	40 "
Oxygen	55 "	Oxygen	28 "
	262 "		262 "

The chief results of the absorption of oxygen by the soil is the disintegration of mineral fragments, the decay of organic matter, and the supply of this element for respiration of the under-ground parts of the plant. The absorptive power of the soil may be increased by deep and frequent ploughing as well as by the addition of such materials as clay and organic matter which possess the quality of absorbing gases in a high degree.

13. The ammonia of the atmosphere is absorbed in the same way as oxygen and nitrogen, viz., by the surface attraction of the particles of soil. The ammonia absorbed by attraction is soon converted into Nitric acid by oxydation, and probably ammonia enters also into other chemical combinations and remains as ammonia in complex combinations (silicates). Considering the fact that the atmosphere contains but a small quantity of ammonia, the absorption of this element by the soil cannot be great. Carbonic acid behaves similarly to ammonia in the process of absorption. The air of the soil contains much more Carbonic acid than the atmosphere, the absorption of this gas is very great in clay soil owing to its capacity to absorb Carbonic acid. It is even possible that in a sandy soil, which has been newly manured with organic matter, the air of the soil should possess so great an amount of Carbonic acid that it may be

partly lost by diffusion into the atmosphere. For this reason light and frequent manuring with organic stuffs is especially adapted for sandy soils, whereas a clay soil, which possesses the power of absorbing a great amount of Carbonic acid may, without much risk, receive a heavy manuring. 1,000 volumes of atmospheric air contain 4 volumes of Carbonic acid. Boussingault and Lenis found that in newly-manured soil, after rain, the air contains as much as 9 per cent. of Carbonic acid.

14. Of far greater importance than the absorption of Carbonic acid is the absorption of water gas from the atmosphere. Atmospheric air always contains a certain amount of watery vapours which are attracted and absorbed more or less by solid substances, of which such as possess this quality in a high degree are said to possess a great hygroscopic power. Porous substances absorb a great amount of watery vapour. The hygroscopic power of the soil is considerable, clay absorbs 6 per cent. and humus, in form of peat, as much as 24 per cent. of its weight, in watery vapour. The more clay and humus a soil contains the greater is the absorption. It was found that a sandy soil, containing much organic matter, absorbed 70 per cent. of its weight in water, but after being ignited only 0·12 per cent. This illustrates the importance of organic matter in the soil especially in hot climates. A soil having much organic matter may, when properly tilled, in many instances, receive all the water required for the production of crops by air irrigation, that is to say, the atmospheric air circulating freely in the soil can supply all the water needed by the plants. When we remember that it has been found in Europe that plants often exhale, from their leaves, up to seven times as much water as they receive by rain, *so that about* 80 *per cent. of this water must have been absorbed from the atmosphere*, it must be admitted that the absorption of watery vapour by the soil is a power of nature deserving the greatest attention. The hygroscopic power of the soil, depends not only on the nature of its chemical constituents but, in a great degree on its mechanical condition; the soil can only then absorb moisture, when the air is allowed to circulate in it; the deeper the earth is broken up, and the more it is pulverized, the more freely will the air be able to circulate and the greater will be the absorption. Clay absorbs more moisture *than sand*, the particles of this soil being much more fine and numerous and each forming, so to speak, the centre of a watery vapour zone. The more moist the atmosphere is, the more moisture will be absorbed, and to this circumstance must be attributed the fact that islands, and places situated near the sea, frequently produce the most luxurious crops, even with little or no rain-fall. The lower the temperature the more moisture can be absorbed, and therefore, in hot climates the soil will absorb a larger quantity of moisture during the night, than in the day. Many soils cannot absorb any quantity during the day when the atmosphere is very dry and the soil contains little organic matter.

15. But the great change in temperature during day and night, observable, generally in hot climates, is most favorable to absorption; since, by the sinking of the temperature of the soil during the night, the watery vapour enveloping the particles of soil is condensed to liquid water, the formation of dew takes place, which penetrates the earth, and the soil is thereby enabled to absorb and condense watery vapour continually, so that although the attraction of watery vapour in a hot climate is less than in a cold one, the total amount of absorption, may be much greater in the former than in the latter.

16. Another important improvement effected by deep tillage is the increase of the capacity of the soil to hold liquid water. This capacity depends entirely on the porosity of the soil, that is, on the number of the capillary tubes or spaces the soil contains. As shown before, every soil, even when its particles are divided to the utmost, possesses spaces between those particles. These interstices determine the capillarity of the soil. They are of various dimensions, some being so small as to be able to hold water between them which are called capillary spaces of the soil. The larger ones have no capillary qualities and are under ordinary circumstances filled with air; the more capillary interstices a soil contains, the more water can it hold. One cubic foot of soil containing much rough sand possesses much fewer capillary interstices than a cubic foot of pure clay soil. The interstices of the latter are all capillary and such a soil can hold a greater amount of water, a quantity that may be beneficial or

injurious according to circumstances; on the whole, it would be more beneficial in a dry climate than in a wet one, where great moisture, caused by heavy rain-fall, very often proves a serious impediment to the production of plants. The occupation of all interstices by water, prevents the air from circulating in the soil, and the great amount of heat that becomes latent by the evaporation of the water makes the soil cold, a term used and well understood by practical Agriculturists.

17. The reduction of the heat of the soil, so undesirable in cold and humid climates, is a desideratum to the Cultivator in a warmer region. For this reason a clay soil possessing a great amount of organic matter, in order to create larger spaces for circulation of the air and to facilitate tillage, is the best adapted for a warm climate, by taking up the greatest amount of rain-water falling, generally in long intervals, and by allowing it only gradually to evaporate, thus keeps the soil to a certain degree, moist and cool. Of all soils, clay possesses the qualities which under every circumstance admit of most improvement by tillage. In hot climates, the rain falling with great force to the ground closes the surface of clay soil more or less, thus preventing the admittance of air which is the most essential factor in vegetable life. The clay, with its fine capillary tubes, displaying a great tendency to attract the water allows that fluid only slowly to pass into the soil, so that, when a rather heavy shower of rain falls, the water collects on the surface and converts the very fine particles of soil into a viscid paste covering the whole surface with a dense sheet impervious to water and which after becoming dry forms a crust that precludes the admittance of air. The chief cause of the formation of the crust is the evaporation of the water. It is well known that the height to which a liquid can rise in a capillary tube depends on the diameter of the tube and the chemical composition of the liquid, but, the fact that the temperature of the liquid and of the tube, is a principal agent in this process, is perhaps not so well understood. Wolf, who made minute investigations in this direction, found that the higher the temperature of the liquid or of the capillary tubes is, the less will be the height to which the liquid can rise. This is proved to be the case in Indian soils, where the salt rises to the surface of the land especially in the cold season after the heavy rains, that have reduced the temperature of the soil are over, and very little after the rains in the hot season. Generally pure water rises higher in the capillary tubes than a solution of salt; a concentrated solution can only rise to a considerable height in very narrow capillary tubes, and at a low temperature. It is evident that the clay soil whose interstices, owing to its fine particles, represent very narrow capillary tubes, is best qualified for the passage of the salt, from the subsoil to the surface. When after the rain in the cold season rapid evaporation takes place the minute capillary tubes, between the fine particles of the clay, possess so much attraction as to allow the solution of salt to rise to the surface from a considerable depth. There is no doubt that a soil saturated with water, possessing no drainage, promotes the rise of salt, because, much more evaporation taking place a larger amount of salt is conveyed to the surface, and then, the large amount of water in the soil being less saturated with salt on account of its abundance, is capable, as shown above, of rising to a great height. The force of the falling rain may produce a similar effect by beating down the soil and thereby reducing the size of the capillary tubes. A soil possessing more than a certain percentage of soluble salt in its upper surface is unfit for the production of the higher species of plants. It has been found by the artificial culture of plants in water, that the concentration of the salt solution should not be more than 0·5 per cent., though the water in the soil may probably contain a higher percentage of salt without proving injurious to the plant. As the minute capillary spaces are the vehicle by which the salt is conveyed to the surface, it is evident, from the foregoing consideration, that by reducing the number and enlarging the size of these spaces, only a small proportion of salt, if any, would be able to reach the surface. We have it in our power to effect this, by deep and frequent tillage, and, the addition of such matter as will reduce the capillarity of the soil, by enlarging the interstices to such a degree as to exhibit very little adhesion to the salt solution, and thus render it incapable of rising. Drainage, is another means of counteracting the rise of salt to the surface by preventing the too great accumulation of water in the soil. By tillage the spaces of the soil become greater rendering the soil loose, so that many of

them losing their capillary power entirely, are rendered unable to conduct the salt to any height. The deeper the tillage and the more open the soil is kept, the more will this end be effected. It is true the dissolved salt will, if the subsoil be impervious remain immediately below the strata operated on by the plough but this may be let off by drains cut at certain depths. A soil constantly kept open will not only prevent the rise of the dissolved salt but to a great degree also that of pure water so that such a soil will keep the moisture longer than one whose capillary spaces are small. The crust, formed after rain should therefore be broken up as soon as the condition of the soil will permit it, in order that the capillary water-level may be kept lower and the admittance of atmospheric air be facilitated. It must be admitted that the capillary water evaporates into the larger interstices filled with air and is apt to be diffused to some extent in the circulating atmospheric air, especially when this is very dry.

18. The injurious effect produced by dry parching winds may be easily neutralized especially when blowing always from the same direction by planting some rows of trees or a good hedge on the side from whence the wind proceeds; and this will not only preserve the soil from becoming too dry but will also increase its capacity for absorbing moisture from the air. The benefit to be derived from deep ploughing will be especially manifest with regard to the falling rain. In climates subject to drought it is of the utmost importance to utilize every drop of water that falls from the clouds. Sandy soils (if the grains are not very fine), are sufficiently porous to admit of the passage of the rain-water into them. The finer the grains are, the more will the passage of water be impeded; that if the showers of rain are heavy, most of the water will run off from the surface. It is often to be observed that after a heavy shower of rain of perhaps 1½ inch, a soil of this kind which should be saturated to a depth of about 6-7 inches has become wet only to a depth of 2-3 inches, the texture of the soil having become so close as to admit only about one-third of the falling rain the other two-thirds having run off and be utterly lost. This may be observed even in fields whose surface is nearly level. A section taken from such a soil after rain in the dry season will exhibit its upper layer to the depth of some inches as excessively wet and the layer below completely dry, both which conditions impede the growth of plants.

19. As soon however as the soil is properly tilled to a great depth so as to have wider spaces between its particles, the falling rain following its gravity will pass freely into the soil and extending down to a great depth will administer moisture with a greater degree of uniformity, and thus avoid excessive humidity. As a soil of this description is very apt to close again, it can only be effectually worked under certain conditions, the greatest attention is required in order to keep it in a state favorable for that purpose. A great amount of organic matter will however tend to remove all difficulties, and to render the soil so loose as to admit a large quantity of water, the free entrance of air and spreading of the roots of the plant will thus be facilitated and the soil be in a condition to be worked almost at any season. By deep ploughing, the roots of the plants will be encouraged to penetrate deeper into the ground, thus coming in contact with a much greater amount of plant food and a more regular supply of water resulting in the production of a more abundant crop. It would not be too much to assert that in many places, if the subsoil is not much inferior to the surface soil, one deep ploughing or subsoil ploughing every year, perhaps only every second year, with frequent stirring up of the upper soil and adequate manuring in the meantime would produce a double and perhaps even a three-fold yield of crop. When the roots are prevented from striking down into the subsoil, the plants will suffer from every change of weather and temperature, their roots not meeting with either a sufficient amount of plant food or water in such a limited space. Many crops cannot attain maturity on account of suffering from the bad effects of shallow tillage, for the evaporation of water from the plants being greater during the day than what the soil can store up the preceding night, the tissues of the plants become contracted to such a degree as to be rendered unfit to perform their functions of imbibing water again, so that the plants wither and die. Other plants again will commence flowering when scarcely half grown, the little moisture at the disposal of the plants under shallow tillage not sufficing for the formation of new organs or the completion of their growth,

Great dryness, is favorable to flowering and the production of fruit, but here the material for the formation of the seed is not prepared and the plants must succumb before attaining this stage of development.

20. A soil exhibiting a hard close impervious pan will hold less water than it will hold after it has been pulverized; but when made very loose many of the interstices will become so wide as not to be able to exercise any degree of capillary attraction.

21. With rough sand however, the case is different, its grains when lying loose together exhibit large spaces possessing little capillary force, but which becomes greater on the sand becoming more compact, so that the capacity of the same soil may vary more than 10 per cent. The capacity of agricultural soil to hold water varies from 20 to 100 per cent. of the weight of the soil; the former estimate referring to a sandy soil, and the latter to a clay soil which is very rich in organic matter.

22. Of course the capacity of a sandy soil to hold water depends chiefly on the largeness of its grains. Nearly pure but very fine sand may hold as much as 30 per cent. of its weight in water. A soil having its capillary tubes filled with water for some length of time can only produce aquatic plants such as grow in marshes.

23. Most plants, especially those of the higher type, will thrive only in a soil alternately saturated and dry, whilst other species can accommodate themselves to any circumstances. Some plants that have vegetated only under dry cultivation may nevertheless in the course of time gradually change their character altogether and become aquatic plants and *vice versâ*. Of all plants rice is the most capable of bearing a saturation of the soil for a long period and so with meadow herbs and grasses; yet these also, especially the higher varieties, will thrive best in a soil which is sometimes saturated.

24. There can be no doubt but that every species of plants and even each variety possesses certain peculiarities, as regards the amount of water in the soil conducive to its growth, which vary according to climate and soil. In this view the soil will only then yield the most abundant crop when this speciality of the plant is satisfied. The soil after being saturated with water loses a portion of it more or less rapidly according to the degree in which the water adheres to the soil. The evaporation is very rapid during the first few days, when a sandy soil possessing little organic matter may lose as much as half of its water. The more organic matter and the more clay the soil contains the more slowly will the water evaporate, so that such a soil contains for a long time after saturation has taken place as much as ½-⅔ of the amount it held at first; whereas a sandy soil, poor in humus, will retain only ⅓-¼ of its water under similar circumstances.

25. The relation between the capacity of the soil to hold water and its vegetative power, depends very much on the quality of the soil. One of a sandy or loamy character, possessing much organic matter, may hold as much as 80-90 per cent. of water and may be more favorable to vegetation than a clay soil holding only 60-70 per cent., since the former being more loose encourages the evaporation of water as well as the circulation of atmospheric air. Loose soil may hold 100 per cent. water. In a soil containing a greater amount of organic matter, certain species of plants may grow as long as it contains not less than 10 per cent. of the amount the soil can hold, the absorption of the atmospheric moisture replacing the consumption. The limits between which the water in the soil may vary, without being injurious to vegetation by either too great dampness, or dryness, depends on the nature of the soil.

26. Loose sandy soil possessing ½-¾ of the water it can hold, appears best suited for most plants, whereas clay soil, unless possessing much organic matter, will be injurious to the growth of most plants if it contains for a long period as much as half the water it is capable of holding. There may be cases where the soil contains a small percentage of water and is even unable to absorb a considerable amount of moisture from the atmosphere and yet the plants growing on it will be found to thrive wonderfully well. In these instances the water needed is supplied from the under-ground water-level. It may be observed that water cannot rise higher than three feet by capillary

attraction. In sandy soils it seldom rises higher than one foot, so that when the subsoil water-level lies lower, the water can only rise in the form of vapour. Water is converted into vapour at every temperature. If the subsoil contains water and the upper soil is dry, the water gas rises through the capillary tubes to the upper soil, but if the temperature of the upper soil is lower than that of the subsoil, the water gas becomes condensed to liquid water in the form of dew. As the temperature of the upper soil generally sinks during the night below that of the subsoil, a considerable amount of water may rise to the surface soil and be condensed there, especially when the subsoil is open and the water-level does not lie too deep. It has been found that in a glass tube measuring five feet in length and two inches in diameter which was filled with sand, the water rose by capillary attraction to the height of 7½ inches. The upper part of the tube was exposed to direct insolation, yet after eight days' exposure the moisture in the upper layer was not changed. All the water evaporated from the surface was here replaced by the watery vapour rising from the subsoil through the capillary spaces, which has become condensed in the surface soil to liquid water.

27. The foregoing cursory exposition of some of the physical properties of the soil, will, it is hoped, serve to prove the important share which the physics of the soil claim in reference to the cultivation and production of plants, a science worthy to hold a place by the side of Agricultural Chemistry, but which has, unfortunately, been utterly neglected in India, to the detriment of the Cultivator.

28. Again and again, have men of science pointed out the danger accruing from a disregard to the laws of nature, as influencing the physical condition of the soil, a neglect which is less felt in localities possessing a rich virgin soil and a favorable climate, but infinitely more in countries where vegetation depends in a great degree on the physical properties of the soil. It may often happen that the capacity of the soil to absorb moisture from the atmosphere is of itself sufficient to decide the question as to whether a crop can be grown on it or not, whether animal life can find the means of subsistence, or must be left to perish.

SYDAPET,
13th *October* 1877.

(Signed) K. SCHIFFMAYER.
Asst. Supt., Govt. Farms.

SOME MANURAL SUBSTANCES YET UNUTILIZED IN THIS COUNTRY.

1. In previous Reports, attention has been directed to the manural value of lime, saltpetre, salt, oil-cake, aquatic weeds, tank scourings, brick-kiln ashes, &c., substances, which are either altogether unused in our agriculture, or are used only to a very limited extent, and, most of which can be obtained in some quantity, and at reasonable prices, over the greater part of the Presidency. I would now invite attention to other fertilizing matters that, are equally neglected by our cultivators, and which, are all procurable in considerable quantities and, at little cost. These are;—human excreta, the refuse matters of slaughter-yards, and, the remains of animals.

Human excreta wasted.

2. *Human Excreta.*—There is an enormous loss of fertilizing matters in this country in the total waste of the excreta of man. In the plains towns they are, of course, always collected and removed from human habitations but, in such cases they are simply buried in the ground in some convenient locality, not however in view to their future utilization. In the villages, and throughout the rural districts generally, these matters are not even collected, but left to waste away where deposited; the result of the practice is, that the waste land, in close proximity to the larger villages, is frequently in a very disgusting state.

3. We have, unfortunately, in this country, no satisfactory data by which we can determine the exact manural value of human excreta; but in Europe, during the past twenty years, such matters have received great attention from Chemists. In a paper, on the Agricultural value of Earth Closet Manure, published in the Journal of the Royal Agricultural Society of England, Dr. Voelcker, F.R.S. the Consulting Chemist of the Society, has discussed very fully the chemistry of human excreta. He says;—

Dr. Voelcker's opinion of the manural value of human excreta.

"Their composition, I need hardly say, is subject to considerable variations; and consequently all calculations based upon analyses of these matters are liable to considerable fluctuations. Speaking generally, solid human excreta, as they leave the body, contain about one-fourth of dry matter and three-fourths of water. The dry matter contains about 1½ per cent. of nitrogen and 1 per cent. of Phosphoric acid.

Composition of human excreta very variable.

"According to Professor Way, human faeces, in a recent condition, are stated to contain in 100 parts;—

Water	75·00
Organic matter	22·13
Insoluble silicious matter	·37
Oxide of iron	·13
Lime	·43
Magnesia	·38
Phosphoric acid	1·07
Sulphuric acid	·06
Potash	·30
Soda	·08
Chloride of sodium	·05
	100·00

"If it were possible to dry faeces without loss in fertilizing matters, and without the addition of bulky materials, they would, in a dry state, be a very valuable manure, for in that state they would contain;—

* Containing nitrogen 1·50, equal to ammonia 1·82.

Organic matter*	88·52
Insoluble silicious matter	1·48
Oxide of iron	·54
Lime	1·72
Magnesia	1·55
Phosphoric acid	4·27
Sulphuric acid	·24
Potash	1·19
Soda	·31
Chloride of sodium	·18
	100·00

"It appears from the preceding figures that, in a perfectly dry condition, two tons of solid human excreta are worth almost as much as one ton of Peruvian Guano; and it seems a great pity that a manure possessing such a fertilizing value should be wasted as at present it is in a great measure.

High manurial value of solid excreta.

"Still more valuable as a manure is human urine, for its principal constituent—urica—contains nearly 50 per cent. of nitrogen; and uric acid—an active constituent of urine—contains about 33 per cent. of nitrogen; and besides these nitrogenous organic matters, human urine contains a good deal of Phosphoric acid.

Urine.

"Unfortunately urine enters very rapidly into decomposition, giving rise to foul-smelling gaseous products of decomposition, and to volatile carbonate of ammonia; and on keeping, loses much of its most valuable constituents. The collection and preservation of urine, in consequence, is attended with practical difficulties, which are greatly enhanced by the trouble and expense of getting rid of the large proportion of water which urine naturally contains. For these reasons, all attempts to collect urine and to obtain from it a solid manure by evaporation have hitherto proved failures in an economical point of view.

"Fresh urine contains, on an average, only 3 per cent. of solid matter, and, according to Professor Way's analysis consists of:—

Water	97·000
Organic matter	2·926
Insoluble siliceous matter	·003
Oxide of iron	·002
Lime	·018
Magnesia	·014
Phosphoric acid	·040
Sulphuric acid	·014
Potash	·059
Chloride of potassium	·163
Chloride of sodium	·566
	100·000

"Notwithstanding this large proportion of water, the amount of solid matter in the urine voided in a day is just about one-third greater than the amount of dry matter in the daily solid evacuations.

"It is not easy to calculate with great precision what is the total amount of fæces and urine which is produced by a mixed population of adults and children of both sexes; but it may be assumed, and that probably upon sufficient data, that the amount of dry matter in the solid and liquid excreta of man does not exceed 56 lbs. per head per annum. Professor Way found 3 oz. of dry matter in the solid and liquid excreta of one person in 24 hours, and 3 lbs. of urine in 24 hours, we obtain [illegible] population does not exceed 56 lbs. per head per annum. Assuming that the amount of dry matter in the solid and liquid fæces and 6 lbs. of urine in 24 hours, we obtain [illegible] than 45 or 46 lbs. In some experiments which I made in 1865 I found 3 lbs. of urine 1½ oz. of dry matter, or in round numbers 1 oz. of dry matter in 2 lbs. of urine. Assuming that individual voids in 24 hours about ¼ lb. of the liquid excreta of man contain one-half more than this, and analysis fairly to represent the composition of a population to produce ¼ lb. of

"In calculating the amount of ammonia which will be produced by the decomposition of the solid and liquid excrements of each person [illegible] For Annum.

" [illegible] 23 lbs. "

" [illegible] 34 " "

" [illegible] matter than the solid.

" [illegible] al on the decomposition of [illegible] annum, we obtain from the

	Ammonia.
23 lbs. of dry matter contained in the solid excreta	1·60 lbs.
34 lbs. of dry matter contained in the liquid excreta	8·12 "
or altogether	9·72 "

"In other words, five-sixths of the ammonia capable of being generated on the decomposition of human excreta is furnished by the urine. By a similar calculation I find that, according to the preceding data, each individual would furnish about 5½ lbs. of phosphates per annum. For simplicity's sake we may assume that each person of a population produces in the solid and liquid excreta 56 lbs. of dry matter per annum. These 56 lbs. produce in round numbers 10 lbs. of ammonia and 5½ lbs. of phosphates."

4. I offer no apology, for making such a lengthy extract from Dr. Voelcker's Report for, I believe it to contain the fullest and most valuable information available, on the agricultural value of the excreta of man; and, but few persons in this country are likely to have met with a copy of Dr. Voelcker's Report.

5. There must, of course, be a very wide difference between the manural value of the human excreta of this country and of that of Europe. In India, the food of the people is bulky and innutritious consisting chiefly of grain, animal food forming but an inconsiderable item.

6. The agricultural value of ordinary human excreta in this country, cannot but be low, from the known poverty of the food of the people. It is a well-ascertained fact that the quality of the food of man, or beast, determines the manural value of their excreta.

7. The bulk of the solid excreta of man in India is said to be greater than in Europe; but it is improbable that it contains a larger quantity of solid substances. We may, I think, estimate that in this country the dry substances, in mixed excreta of man, will weigh, per head of the population, about 45 lbs. capable of yielding, on decomposition, say, 6 lbs. of ammonia and 3 lbs. of phosphates. Of course, these figures are but estimates, they are however based on the best information we possess.

Human excreta bulky in this country.

8. From these figures, it would appear that the average value of the liquid and solid excreta of one person, of our mixed population of adults and children, is, as follows:—

	Rs.	A.	P.
6 lbs. of ammonia at 6 Annas per lb.	2	4	0
3 lbs. of phosphates at 1 Anna per lb.	0	3	0
Other matters	0	1	6
Total value of excreta, per head, per annum	2	8	6

The values, put upon the fertilizing matters, are the prices which similar manural constituents sell for, in portable manures, in this Presidency.

9. No attempts have been made in this country to collect the liquid excreta of man hence, for all practical purposes, its value must be left out in our calculations. From the extracts given, it appears that human urine, in Europe furnishes five-sixths of the ammonia generated on the decomposition of mixed excreta, and about three-fourths of the phosphates. We must therefore deduct from Rupees 2-8-6, the value of five-sixths of the ammonia and three-fourths of the phosphates of the mixed excreta, which together, amounts to Rupees 2-0-3, leaving Annas 8, Pies 3 or, say, in round numbers, 8 Annas, per head, as the value, in one year, of the solid excreta of one person.

Liquid excreta never collected.

10. In rural districts, the utilization of the human excreta is attended with but few difficulties, from the readiness with which it can be mixed with earth and village ashes and, made into a compost, in which form the stuff readily becomes deodorized. The Ryots object, and with good reason, to collect and remove to their land the excreta of town populations, for setting aside all considerations relating to caste prejudices, the work is an exceedingly unpleasant employment, while the intrinsic value of the stuff is frequently very low, from natural poverty or admixture with useless matters.

In rural localities no difficulty in utilising excreta.

11. If Municipal Corporations would get rid of the night-soil of their towns, by its utilization in agriculture as manure, they must convert it into a concentrated compound free from admixture with useless matters. There is no reason why poudrette should not be manufactured at, or, near many, of our large towns. Manufactories for the preparation of poudrette have been established near many European towns, and the objectionable characteristics of such manufactories would not be greater in this country. Indeed, I think, that we have, in our dry atmosphere and high temperature, excepting during a small portion of the year, conditions highly favorable for the manufacture of poudrette, provided, always, that proper means are taken to check, or, keep back, the putrefactive processes which, in this country, operate so quickly.

Town excreta must be prepared for use in agriculture.

12. There are many different waysby which solid excreta can be converted into a portable manure, for instance, by admixture with dried clay, burnt clay, ashes, caustic lime, sulphate of iron, gypsum, animal charcoal, &c. In China, it is worked up with clay into the form of bricks which, after being dried, are laid aside until required, when they are pulverized for application to the soil. Burnt clay is also used, to some extent in Europe and also died clay, the latter, is the material used in "Moule's Earth Closet System," but, clay, whether burnt or dried, must be used in considerable quantity in proportion to the bulk of the excreta, hence, the mixture will not bear the expense of distant cariage. Ashes, are well suited for admixture with excreta but, the large bulk of the compost is objectionable unless, the land to which it is to be applied is in close proximity. Caustic lime mixed with excreta prevents any unpleasant smell, and the mixture is an excellent manure, but, the lime should be added only when the excreta is in a fresh state or, the ammonia will be entirely driven off; there is certainly loss of ammonia when the lime is added to the fresh excreta but, it is small. Where sulphate of iron can be obtained, at a price sufficiently low, it forms an excellet material for mixing with solid excreta. Powdered gypsum has been largely used in Europe for converting excreta into a portable manure Animal charcoal, the refuse of sugar refineries is, perhaps, the best material that has ever been used for mixing with soli excreta, not only does it thoroughly deodorize the stuff but, it adds immensely to itsmanural value by the phosphates it contains. In some localities in this country, animal charcoal, the refuse of sugar refineries, can be purchased in considerable quantitie, at a very reasonable cost; I recently had an offer of 600 tons at Rupees 35 per ton delivered in Madras, this charcoal, contained upwards of 50 per cent. of phosphate olime; near the sugar refinery from which, the charcoal was offered, Rupees 25 per ton would have been accepted, which is a very low price, for a manure so rich in phosphates.

Animal charcoal a good material for admixture with excreta.

13. However, my present objecis not to deal with that difficult problem, the utilization of the excreta of town populations; I desire only to point out that in rural districts on the plains, where there areno difficulties attending the utilization of this useful manure, it is entirely lost to agculture.

14. On the Nilgiris, where mut land is in the hands of Europeans, human excreta is highlyvalued. The Coonoor Municipality in 1874-75 realized Rupees 3,866 for nightsoil and sweepings, and in the next year they alized Rupees 3,150. Four-fifths of the last mentioned sum, Rupees 2,520, represes the amount realized for the solid excreta of Coonoor in one year, which is about Anas 13½ per head of population. This is, of course, a much higher return than wdd be obtainable elsewhere in the Presidency, manure being so costly on the hills, owig to the great demand and, the difficulty of obtaining it; while, something must al be attributed to the excreta possessing a somewhat higher fertilizing value than at of more poorly fed populations. Thomas Stanes, Esq., who has used nightsoil ygely on his estates at Coonoor, informs me that he finds to be an excellent manure. In dealing with this manureMr. Stanes' usual practice is to make it into a compost with other manure, and tkeep it in a heap for a year, or so, when it is found to be sufficiently decomposed andeodorized for distribution over the land.

High value of human excreta on the hills.

Method of using excreta.

15. At Ootacamund, the Municipality manufacture poudrette from a mixture of human excreta, sifted ashes, dried earth, blood and animal charcoal which, they sell readily, on the spot, at Rupees 7 per ton. The following shows the quantity of this poudrette made and, the amount realized for it, in each year, since the commencement of the manufacture;—

Poudrette.

	TONS	RS.
1867-68	..	170
1868-69	..	162
1869-70	..	186
1870-71	68¾	469
1871-72	213	724
1872-73	220	870
1873-74	260	1,307
1874-75	210	1,423
1875-76	432	2,861

Mr. Stanes informs me that he uses this manure, to some extent, on his coffee estates; and that, he finds it a valuable manure, one cart-load producing as good an effect as four cart-loads of ordinary cattle manure.

16. *Slaughter-house Refuse.*—The refuse of slaughter-yards is, also, in this country, almost entirely wasted. It is difficult to obtain data, by which this loss to our agriculture can be ascertained. I possess statistics relating to Madras however which, will throw some light on the matter. In the City of Madras about 8,000 head of cattle, and, 220,000 sheep, are killed annually, in the Municipal slaughter-yards. The population, at the last Census, was 397,552 persons, of whom, probably, not more than 17,500 were total abstainers from animal food, leaving fully in round numbers 380,000 flesh-eaters.

17. The amount of butcher-meat consumed, per head of the population, is exceedingly small, due chiefly (as regards mutton) to the great poverty of the people. Under ordinary circumstances a pound of mutton, per day, suffices for the wants of a Hindu family of six persons; but, small as this consumption is, *at the least* 12 *sheep would be required in a year*, for such a family. By far the largest number of the inhabitants of Madras who would gladly eat mutton, purchase it only on ceremonious and other special occasions, as a luxury.

Small consumption of meat due to poverty.

18. From experiments, I have made, I find that, a bullock of about 500 lbs. live weight, in a condition somewhat better than that of cattle when slaughtered for food in this country, will yield about 42 per cent. of saleable meat, the offal, thus being about 58 per cent. of the live weight; this is a much higher percentage than the offal forms of oxen in England, thus Mr. Laws, F.R.S., in his well-known paper on the composition of oxen and sheep, shows that the mean percentage of offal in 16 bullocks was only 38·85 per cent.

Offal of oxen.

19. Assuming that, the average live-weight of a bullock, when slaughtered in Madras is 500 pounds, per head, and that, the offal weighs 58 per cent. of the live weight, the offal of one bullock will weigh 290 pounds, from this 290 pounds, we must deduct about 60 pounds, the weight of the portions of the offal, hide, hoof, head, tongue, &c., that are utilized, and there remains 230 pounds, of which 20 pounds is blood, as the weight of the refuse matters, from one bullock.

20. Blood is, of course, the most valuable portion of the refuse, it has long been known to be a most powerful manure, its composition resembles very closely that of flesh. Blood contains about 80 per cent. of water and 20 per cent. of solid matter, rich in nitrogen. Fully one-half of the ash of dry blood consists of common salt, the remainder of the ash is, chiefly phosphate of soda and phosphate of lime; but as the ash constitutes only about 5 per cent. of the dry matter of blood, it does not possess much agricultural importance.

Blood valuable manure.

21. In England, fresh blood is occasionally used for mixing in a compost with ashes, generally at the rate of six gallons of blood to about one bushel of ashes; the blood is purchased, at from 3 Pence to 4 Pence a gallon; the compost after laying for a year in the heap, is thoroughly

Blood made into a compost.

deodorized and fit for use. On the Sydapet Experimental Farm, some of the blood and other refuse of the Commissariat slaughter-yards are utilized in the way just described, the manure after nine or ten months is found to be quite free from smell, and, in a dry powdery state.

Conversion of blood into manure.

22. The method usually followed in dealing with blood, is to dry it in a steam-cased vessel, in which, about 60 per cent. of the moisture is driven off. Professor Way, examined many samples of dry blood, the following are the results of three average samples:—

	Water.	Ammonia.
Sample 1	8·78	16·07
Do. 2	7·91	16·49
Do. 3	6·19	16·91

It will be noticed that, the percentage of ammonia is very high, equal indeed to the amount found in ordinary Peruvian guano; blood is therefore of great value, as a manure for tea and sugar-cane plantations, for betel and plantain gardens, for cocoanut trees, &c.; sometimes blood is coagulated under the influence of heat, after which, it is broken down, mixed with charcoal gypsum, &c., and dried again, when, it is an excellent portable manure, and sells readily.

High manurial value of dry blood.

23. The fresh blood yielded by a bullock should be worth from 5 to 6 Annas. I fear that it is only as a *dry* manure, that blood could be utilized, in such a town as Madras, from the difficulty of transporting it to the land and the absence of local demand.

24. Estimating that the 20 pounds of liquid blood will yield 5 pounds of dried blood, containing 16 per cent. of ammonia, the blood of one bullock should be worth nearly 5 Annas, valuing the ammonia at 6 Annas per pound, but, of course, against this there is the cost of preparation.

Value of offal of one bullock.

25. The other refuse of the bullock, consisting of intestines, contents of stomachs, &c., will weigh about 210 pounds and, should be worth 7 Annas and 6 Pies, valuing it at 5 Rupees per ton, this 7 Annas and 6 Pies with 5 Annas for the dried blood, makes the total value of the refuse offal of one bullock Annas 12, Pies 6, or, in round numbers, Annas 12.

26. We thus find that the *whole* refuse of the cattle slaughtered at Madras should be worth, at the least, Rupees 6,000, of which Rupees 2,500, would be the value of the dried blood.

27. Excepting in the larger towns where Europeans and Eurasians reside, there are but few cattle slaughtered for food, and the loss of manurial substances from this source cannot be otherwise than small, compared with that which results from the waste of the offal of sheep slaughtered for food.

Offal of sheep.

28. The offal of a sheep, killed when in the ordinary condition, weighs about 55 per cent. of the live-weight of the animal. In the Commissariat slaughter-yards at Sydapet, 409 sheep, which weighed 25,866 pounds live-weight, yielded 11,668 pounds of mutton, equal to 29 pounds of mutton per head, of 62 pounds live-weight, in this instance, the offal was about 54 per cent. of the live-weight. Mr. Laws, in his experiments, before referred to, found that, the skin, head, liver and other portions of the offal of a sheep, which are utilized, weighed about 14 per cent. of the live-weight, deducting this, we find that the refuse offal is, about 40 per cent. of the live-weight, of which the blood forms 4 per cent.

Sheep killed for food in Madras.

29. In the City of Madras, 220,000 sheep are killed in the year, estimating each of these to weigh 60 pounds live-weight and, that, the refuse offal is 40 per cent: of the live-weight, we find that, the weight of this refuse should amount to, in the year, 5,280,000 pounds, of which 528,000 pounds is blood. Valuing the refuse as before, the blood is worth 8,250 Rupees and, the other refuse Rupees 10,807-2-3 or, the entire refuse of the slaughter-yards in the year, assuming that none of the blood is utilized for food or other purposes, should be worth in round numbers twenty-five thousand rupees, less

the cost of drying the blood; and this refuse, should suffice to manure highly 2,000 acres of arable land every year.

30. The consumption of meat, in the City of Madras, would not, of course, be a fair standard, by which to gauge the consumption of meat over the whole Presidency, and thereby to determine the value of the refuse of animal slaughtered for food. I believe however that, the consumption of animal food in this Presidency, is very much greater than is usually supposed. If, we deduct from the population of the Presidency 1,095,445 Brahmins who, are the only total abstainers from flesh, excepting a small number of Hindu vegetarians, we find that, the flesh-eaters amount to about thirty millions. Even Brahmins, in some parts of India, eat flesh, as the following extract proves;—

* "Another peculiarity in the *dchará* of the Kâsmirian Brahmans is the universal consumption of meat. All eat mutton, goats' flesh, and fish. But they obey the usual restrictions of the Sâstras as to beef, pork, and the meat of other forbidden animals. They usually declare that the custom of eating meat is based on a dêsaguna, 'a virtue of the country,' and that they leave it off as soon as they descend into the plains. They also fully acknowledge the duty of *ahimsâ*, of preserving life, and themselves are by no means willing to kill anything. If told that their acts are not consistent with their professions, they answer that their abstaining from meat would not prevent the slaughter of animals, as the Mahommedans of the country would still require meat. There can be little doubt that the practice of eating meat has come down to the Kâsmirians from the most ancient times. It prevails to a much greater extent in Northern and Central India than is generally known. In the Punjab, the North-West Provinces, Rajputana, and in parts of Bengal all Siva Brahmins eat meat."

31. The Agricultural Statistics of this Presidency, do not show the number of sheep we possessed in any year, since the official year 1871-72, in that year our sheep stock was 6,745,000, while in the preceding Census, of 1869-70, the number of sheep was shown to be 6,196,000, we had, thus, an increase only amounting to 549,000 in the two years. Under the heading "sheep" goats are classed, and these, constitute at the least two-thirds of the number of animals classed as sheep. Assuming then, that, in the official year 1869-70, we possessed, in round numbers, four million goats and that one-third of these were she-goats in a breeding condition, they ought to have yielded, in the year, about two million kids. In the same way we may estimate that, one-third of the two millions one hundred and ninety-six thousand sheep, were breeding ewes, these, ought to have produced in the year, for each 100 at the least 75 lambs, or, 549,000 lambs. The increase of stock would thus be, say, in round numbers, two millions of kids and, half a million of lambs, total $2\frac{1}{2}$ millions. Assuming that, in the following year the increase of stock was the same, and it was likely to be much greater from additional ewes and goats beginning to breed, the increase would represent altogether five millions which, with the stock on hand 1869-70, 6,196,000, should make the sheep-stock in 1871-72, 11,196,000 provided there were no deaths. Putting the death by disease, &c., at 10 per cent. per annum we should have had in 1871-72; 9,293,760 goats and sheep, whereas, we had only 6,745,000, showing a loss of two and a half millions which, I suppose *represents the number of animals that were slaughtered in the year for human food*, the refuse offal of which must represent a very considerable sum, if that of 220,000 sheep is worth as I have already shown Rupees 18,000.

32. *Carcases of diseased Animals.*—But besides the diminution of stock by slaughter there is annually an enormous loss by disease and from natural causes, the aggregate of which will represent an enormous quantity of manural matters that, under present arrangements, are almost entirely wasted.

Death of cattle by disease.

33. Few persons, are aware of the great loss of cattle, by death, during a year in this Presidency. From the Board of Revenue's Administration Report for 1873-74 and 1874-75, I learn that, the number of cattle reported to have died during these official years, was 607,303 and, 710,153; and during the past year, in many localities, 75 per cent. of the

* From a report by Dr. Bühler published in the Journal of the Bombay Branch of the Royal Asiatic Society for 1877, at page 23.

cattle are said to have died. The carcases of animals that have died are never utilized as manure, excepting, on coffee estates; of late a trade has sprung up in bones but, they are collected chiefly for export. It has already been shown that the refuse obtained, when a bullock is slaughtered for human food, is worth, as manure, under average circumstances Annas 12; the remainder of the carcase, consisting of the flesh and bones, should be worth at the least Rupees 1-2-0, making the total manurial value of a bullock of 500 pounds live-weight, Rupees 1-14-0, however, the cattle of the Presidency will not average, in live-weight, more than two-thirds of this weight, to arrive then at the manurial value of one such animal, we must deduct one-third from Rupees 1-14-0 which will leave Rupees 1-4-0 as, the manurial value of the carcass of an ordinary cow, or bullock.

Carcases of animals not utilized.

34. It is evident from the Custom House Returns of this Presidency showing the number of hides and skins exported annually that the death-rate of Farm Stock of all kinds, from slaughter, disease, and other causes, is vastly greater than is usually supposed, thus:—

Hides of Cattle and Skins of Sheep exported.

District from whose Ports the Hides and Skins were exported.	Hides.						Skins.					
	1870-71.	1871-72.	1872-73.	1873-74.	1874-75.	Total.	1870-71.	1871-72.	1872-73.	1873-74.	1874-75.	Total.
Madura	..	..	..	2	..	2	50	365	..	121	4,090	4,626
Malabar	37,664	30,587	52,909	79,983	347,921	549,064	11,332	17,153	12,678	14,294	19,915	75,432
Pakala, Nellore	..	..	..	..	..	..	40	..	..	..	94	134
Madras	164,869	15,544	389,995	432,050	473,326	1,475,293	6,166,862	7,600,834	9,383,314	8,128,749	6,519,491	37,799,247
Cuddalore, South Arcot	..	100	233	..	..	333	520	13,211	1,483	4,940	2,000	22,154
Vizagapatam	158,690	104,253	267,622	173,393	167,034	860,992	141,703	111,495	216,689	180,162	142,100	772,149
Tanjore	..	190	200	50	35	475	1,328	1,706	1,080	2,482	4,495	11,085
Mangalore, South Canara	24,139	24,706	26,759	31,659	31,263	138,526	10,399	1,399	9,974	3,490	2,252	27,505
Godavery	19,851	23,556	26,385	88,165	43,824	271,481	319,337	349,901	309,385	304,807	266,804	1,550,634
Tinnevelly	8,847	3,008	5,089½	17,126	14,637½	44,608	54,905	84,573	67,939	72,547	87,067	367,052
Ganjam	97,570	48,019	120,660	91,178	93,811	451,238	16,657	9,217	17,552	17,369	24,649	85,444
Kistna	3,614	6,102	8,320	8,383	17,222	43,643	..	3,556	8,424	12,526	60,938	85,444
Total ..	509,844	256,965	968,172½	922,000	1,173,773½	3,830,755	6,723,132	8,193,404	10,028,538	8,721,587	7,133,895	40,800,906

Agricultural statistics inaccurate.

35. In this statement it is very probable that some hides and skins have been twice brought to account from their having been shipped to Madras and again reshipped there for export; but, this inaccuracy cannot influence much, the conclusions which must arise from fairly weighing the evidence the statement affords. It will be observed that in one year 1872-73, 10,028,538 sheep skins were exported whereas, the agricultural statistics show that the sheep-stock of this Presidency about that time, amounted only to about 6,745,000. As a sheep-skin can but represent the death of one sheep, it is evident that the agricultural statistics must, as regards sheep, be very inaccurate, for if the whole of the sheep-skins from the minor ports of the Eastern Coast had been shipped to Madras, which, of course, is highly improbable, they would not have added more than about half a million to those delivered in Madras by land. Of course, a number of hides and skins are taken to Madras from Mysore and Hyderabad by railway but, on account of the expensive carriage, it is not probable that this occurs to any great extent.

36. There is thus available to the Agriculturist a large quantity of valuable manural matter which he altogether neglects. I have, in the foregoing, shown the money-value of some of these refuse substances; it may be objected that the prices are higher than could generally be obtained; this, I admit to be true as regards the present time; but, if agriculture was practised as it should be, the prices I have set upon these refuse matters would be fully realized. However, I do not press the views expressed regarding this part of the subject. Whatever may be thought of the money values arrived at, there cannot be two opinions regarding the manural value of the substances.

29*th September* 1877. (Signed) W. R. ROBERTSON, M.R.A.C., *Superintendent, Govt. Farms.*

APPENDICES.

APPENDICES

TO

THE AGRICULTURAL COLLEGE REPORT.

APPENDICES

TO

THE AGRICULTURAL COLLEGE REPORT.

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RECEIPTS OF THE SYDAPET EXPERIMENTAL FARM DURING 1867-77.

Experimental Farm.

	Rs.	A.	P.	Rs.	A.	P.
Fruits, vegetables, &c.	618	8	0			
Fodder, &c.	115	14	11			
Rent, &c.	364	15	0			
Cattle	66	9	0			
Sheep	94	14	9			
Pigs	15	12	4			
Poultry, &c.	257	6	2			
Feeding grains	525	15	6			
Cotton	178	8	6			
Machines	106	7	6			
Indigo	85	6	2			
Seeds	147	14	2			
Sundries	181	3	5			
				2,759	7	5
Implement Workshops.						
Machines, &c.	915	13	0			
Labor materials, &c.	1,423	14	2			
				2,339	11	2
Total ...				5,099	2	7

VALUATION OF THE SYDAPET EXPERIMENTAL FARM ESTATE, BUILDINGS, &c., AND OF THE LIVE AND DEAD STOCK OF THE FARM, ON THE 31ST OF MARCH 1877.

	Rs.	A.	P.	Rs.	A.	P.	Rs.	A.	P.
Land—									
50 acres of land at Rupees 200 per acre	10,000	0	0						
130 do. at do. 140 do.	18,200	0	0						
100 do. at do. 70 do.	7,000	0	0						
Roshumbaukum Village-site	680	0	0						
				35,880	0	0			
Buildings—									
Superintendent's, Overseer's, Students' quarters with out-buildings.	10,000	0	0						
Granary; Barn Cart Sheep and Implement Sheds, and other Farm buildings.	9,800	0	0						
				19,800	0	0			
Wells (23) and channels	.....			3,600	0	0			
Fruit and other trees	.....			4,705	0	0			
							63,985	0	0
LIVE STOCK—									
Cattle	3,980	0	0						
Sheep	1,380	0	0						
Pigs	100	0	0						
Poultry	171	0	0						
				5,631	0	0			
DEAD STOCK—									
Seeds and Grains	494	9	0						
Manures	553	8	0						
Implements	6,617	13	0						
				7,665	14	0			
GROWING CROPS	.....			672	12	0			
							13,969	10	0
Total ...	.....			.....			77,954	10	0

APPENDICES

TO

THE SYDAPET EXPERIMENTAL FARM REPORT.

EXAMINATION REGULATIONS.

I. No student will be allowed to quit the Examination Room until the expiration of half an hour from the time fixed for the commencement of the examination, and a student arriving after the expiration of that half hour will not be admitted.

II. No student will be allowed to re-enter the Examination Room during the examination, after once quitting it, nor to leave the room without finally giving up his answer papers.

III. Any student detected in speaking to, or in any way communicating with, any other student, will be at once removed from the room, and the circumstances reported to the Superintendent, Government Farms.

IV. *No student will on any account be allowed to take into the Examination Room, books or papers of any kind.* Any one detected with such in his possession, or having recourse to any unfair practices, will be removed from the room and the occurrence reported to the Superintendent of Government Farms.

V. A student having completed his paper will rise from his seat and remain standing until the First Master takes his answer papers. Any student wishing to ask any question will pursue the same course but will on no account leave his place.

VI. Each page must be marked with the student's name, and his register number, and each page must be numbered in consecutive order. Any paper sent up without the student's name and number affixed will not be examined.

VII. Students will not be allowed to take any papers, except their question papers out of the Examination Room.

VIII. Students are forbidden to tear up papers or to throw papers on the floor. All "spoilt copies, &c.," should be left on the desk where the student has been writing.

EXAMINATION QUESTION PAPERS.

Winter Session, 1876-77.

AGRICULTURE.

Examination—January 27th, 1877.

I. What are the uses of Farm Fences?

II. State what crops are growing in fields $\frac{B}{4}$ and $\frac{A}{14}$.

III. Why are the soils of the Farm unsuited for growing Tobacco?

IV. State some reasons why Indian Agriculture should be improved.

V. Explain in what way land under crop is benefited by being hoed.

VI. Mention the names of the different parts of an iron plough.

VII. State what work was performed yesterday in fields $\frac{B}{10}$ and $\frac{B}{8}$.

VIII. What kind of oil-cake is given to the sheep, and about what quantity is allowed for each full-grown sheep?

IX. State generally in what way a soil is benefited by deep tillage.

X. What crops are now growing in fields $\frac{A}{11}$ and $\frac{C}{16}$?

VETERINARY.

Examination—February 3rd, 1877.

I. How are living bodies distinguished from inanimate (or mineral) substances?

II. What organs are contained in the abdomen; and what kind of membrane lines the cavity?

III. Name the openings into the fauces.

IV. When the food is swallowed, where does it go, and what prevents it from going into the trachea (or wind-pipe)?

V. How are arteries to be distinguished from veins; arterial blood from venous blood, and what is the reason of the latter difference?

VI. In what respects does white fibrous tissue differ from yellow fibrous tissue?

VII. What is the microscopic structure of a voluntary muscle?

VIII. How many varieties of Epithelium are there, and what are they?

IX. What gives the blood its red colour?

X. Where the ends of two bones are brought together to form a free moving joint, how are they kept in opposition, and what provision is there to prevent friction?

CHEMISTRY.

Examination—February 10th, 1877.

I. What is a simple, and what a compound, body? Give examples. How many elementary bodies are there, and how are they classed?
II. What is meant by the *physical* and the *chemical* properties of a substance?
III. Give the meaning of the terms Cohesion and Chemical affinity.
IV. Define weight. What is the metric system of weights and measures based upon?
V. What is the unit of weight and of capacity in the metric system, and give the equivalents in English measure?
VI. Define Specific Gravity.
VII. You are required to shew how the specific gravity of a sample of milk is determined.

ARITHMETIC.

Examination—February 12th, 1877.

I. From the definition of a decimal fraction, shew that

$$\cdot 7256 = \frac{7256}{10000}.$$

II. Express as decimals $\frac{2^4}{10^2}$ and $\frac{3^5}{10^3}$, and the sum, and the product of the quantities.

III. Simplify:—

$$\frac{\cdot 1\times\cdot 1\times\cdot 1+\cdot 01\times\cdot 01\times\cdot 01}{\cdot 2\times\cdot 2\times\cdot 2+\cdot 02\times\cdot 02\times\cdot 02}.$$

IV. A man in mowing grass walks at the rate of 4 miles an hour; it takes him 72 minutes to mow a grass plot of 1,056 square yards. How broad does he mow?

V. It is agreed that the rent of a farm shall consist of a fixed sum together with the value of a certain quantity of rice. When rice sells at 8 measures a rupee the rent is Rs. 250; and Rs. 280 when rice is 5 measures a Rupee. What will the rent be when rice sells at 6 measures a Rupee?

BOTANY.

Examination—February 17th, 1877.

I. Mention the parts of a flower and state which of these are essential and which non-essential.
II. Give the meaning of the terms acaulis, haulm, achlamydeous, monodelphous, culm, stipe, caudex and claw?
III. Describe a Phyllodium. How does it differ from the blade of a leaf?
IV. Give the names of the different kinds of underground stems, and mention examples.
V. Name the different parts of a fruit. For example, the pod of the common pea.
VI. Mention and describe briefly the different varieties of roots.
VII. Give a sketch of the following kinds of leaves:—
1. Entire.
2. Penninerved.
3. Curvinerved.
4. Palminerved.
VIII. How does a root differ from a stem?
IX. What are the various parts of a seed? For example, that of the Castor-oil plant.
X. What is the leaf arrangement to which the terms opposite decussate, whorled, geminate and fasciculate apply?

MENSURATION.

Examination—February 22nd, 1877.

I. Define a Straight line.
II. Define a Rhombus.
III. Define a Parallelogram.
IV. Define a Surface.
V. Define an Angle.
VI. Define a Trapezium.
VII. Construct a scale 8 feet equal to an inch.
VIII. On what principle is the Plummet level constructed?
IX. What is a Radius?
X. How would you find the breadth of a river without crossing it?

ZOOLOGY.

Examination—February 24th, 1877.

I. Classify the following animals:—

Monkey.	Mouse.	Tiger.	Tapir.	Narwhal.
Elephant.	Sperm Whale.	Bear.	Hippopotamus.	Manatee.
Camel.	Kangaroo.	Sheep.	Rhinoceros.	Mole.
Horse.	Rabbit.	Llama.	Sloth.	

II. Describe the stomach of a ruminant and the process of rumination.
III. How are quadrumana popularly divided?
IV. Show how the order *ungulata* is sub-divided.
V. Describe the teeth of a rodent.
VI. Describe the leg of a ruminant.
VII. How is the order Carnivora sub-divided?

AGRICULTURE.

Examination—March 3rd, 1877.

I. Name the mineral substances found in a fertile soil.
II. Mention the general properties of a clay loam.
III. Under what conditions would it be unwise to plough a soil deeply?
IV. What proportions of sand, clay, and lime are found in the following soils:—
A sandy loam.
A marly soil.
V. How are soils formed from rocks?
VI. What are the characteristics of an alluvial soil?
VII. What was done with the flax crop grown on the Experimental Farm after it was removed from the field, and with what object?
VIII. How would you improve a sandy soil that parted too readily with moisture?
IX. Whence is the Potash in a soil derived?
X. What would be the character of a soil formed by the disintegration of a quartz rock?

ARITHMETIC.

Examination—March 6th, 1877.

I. Divide 30 by 3·14159 to three places of decimals.
II. Convert the following fractions into decimals:—

$$\frac{1}{7}, \frac{6}{7}, \frac{79}{99999}, \frac{79}{93000}, 23\frac{52}{333} \text{ \& } \frac{4111}{83300}$$

Explain why the above fractions cannot be expressed as finite decimals.
III. A country plough can plough a field in 5 days, an English plough can do the same work in three days; how long will it take them to do the work together?
IV. In the Centigrade Thermometer the freezing point is zero and the boiling point is 100°; in Fahrenheit's the freezing point is 32° and the boiling point is 212°; what degree C corresponds to 68° F.?
V. If the produce of a certain cereal crop be 20 times the seed, how many loads can be obtained from an ollock of seed after 5 crops have been raised?

8 Ollocks = One Measure.
8 Measures = One Markal.
42 Markals = One Load.

VI. When engaged in working the water-lift which waters the Carolina paddy, the bullocks walk at a uniform pace of 2 miles per hour round a circle whose circumference is 60 feet. Every circuit turns up 7 buckets, the contents of which are emptied in succession into the water course. Each bucket measures 1 ft. 5 inches long, 10 inches broad and $7\frac{1}{2}$ inches deep. Find how much water is raised in a day of 8 working hours.

VETERINARY.

Examination—March 10th 1877.

I. Describe the greater or Systemic circulation, noting the peculiarity of the portal portion.
II. What is the object of the Pulmonary circulation?
III. What are the differences between air expired from the lungs, and that of the atmosphere?
IV. What membranes cover the lungs, thoracic cavity and heart-sac (pericardium), and what line the pericardium, thoracic cavity, trachea and bronchial tubes?
V. How is the venous blood brought into contact with the air taken into the lungs?
VI. Is the diaphragm an inspiratory or an expiratory muscle?
VII. What is the difference between a true and a false rib?
VIII. What is "Coughing," and what causes it?
IX. What substances are found in the Blood?
X. What are the four varieties of food, and of what Chemical elements do they consist?

CHEMISTRY.

Examination—March 17th, 1877.

I. Define Temperature. What essential difference is there between the temperature of a body and the quantity of heat it contains? What are the scales used? Give the freezing and boiling points on each.
II. Show how to graduate a common Mercurial Thermometer.

VI. The average maximum temperature in Madras during the past month has been 87° 6′ F.; and the greatest cold experienced by the Arctic voyagers in the late expedition was 102° F. below freezing-point. What numbers in the Centigrade Scale correspond to these degrees respectively?

IV. What is meant by Latent Heat? If a piece of ice be put in a saucepan on the fire and kept there, what are the effects on a thermometer placed in the saucepan?

V. What are the three ways in which heat can be transferred from one place to another? Give examples.

VI. Give the meaning of the following:—

Atom; *Molecule*; Crith; Equivalent; Molecular weight?

VII. Give two of the more useful processes for preparing Hydrogen, and explain the chemical changes which result by symbols.

VIII. What weight of Hydrogen will 77 Grammes of zinc liberate from dilute hydric sulphate?

IX. State the properties of Hydrogen, and quote and explain experiments shown to illustrate its lightness and its inflammability.

X. Why is a mixture of Hydrogen and air explosive?

BOTANY.

Examination—March 24th, 1877.

I. What is a pitcher? State the views as regards its formation.

II. What terms are used to signify the various arrangements in the bud of the floral and foliage leaves? and define them.

III. When are stems said to be

(a.) Ascending.
(b.) Prostrate.
(c.) Creeping.
(d.) Climbing.
(e.) Twining.

IV. Describe a leaf-bud.

V. Give the characters of the following kinds of inflorescence:—

Corymb.
Compound umbel.
Raceme.
Cone.
Catkin.

VI. What are the distinguishing characters of a tree, shrub and under-shrub?

MENSURATION.

Examination—April 4th, 1877.

I. How many cart-loads of gravel will be required for a carriage-drive 200 yards long and 16 feet wide, the gravel to be spread 4 inches in thickness? (A cart-load = ¼ a cubic yard.)

II. Required the number of Casuarina trees to plant an acre, the trees to be planted 3 feet part in the rows and the rows to be 4 feet from each other.

III. Calculate the amount of earth in an embankment 300 feet long, 30 feet high, 50 feet wide at the bottom and 15 feet wide at the top.

IV. Shew what area of land the earth in the embankment (see previous question) would cover, if removed and spread uniformly to a thickness of 7 inches.

V. Find the cubical contents of a teak beam 20 feet long, 12 inches thick, and 9 inches broad.

VI. Find the value of the teak beam (see previous question) at 80 Rupees per ton of 50 cubic feet.

VII. How many paving tiles, each 6 inches by 9 inches, would be required to pave a yard 28 feet in length by 19 feet wide?

VIII. Write down the number of square yards in a cawnie, in an acre, and in a ground.

IX. How could you continue the measurement of a straight line, when impelled by an object obstructing the sight.

X. How many squares of plastering are there in a room 15 feet long, 12 feet wide, and 10 feet high, deducting one door 6 feet by 5 feet and two windows 3 feet by 2 feet each?

AGRICULTURE.

Sessional Examination—March 26th, 1877.

I. State what you observed during the last cropping season, regarding the effects of deep tillage, on the Farm.

II. What information does a mechanical analysis of a soil afford?

III. What are the properties of a stiff clay, and what are the means by which such a soil could be improved?

IV. Describe briefly the principal varieties of soils found on the Farm, and indicate generally the portions of the Farm where each variety predominates.

V. If a country plough costs Rupees 3, and an English plough costs Rupees 18, explain in what way a ryot can be benefited by using an English plough.

VI. What advantages are secured by sowing seed by means of seed-drills?

VII. Give the general results of the Sorghum crop recently produced in field ——— and of the Cholum crops recently produced in fields ———, ———, ——— and ———.

VIII. How are soils usually classified?

IX. What mineral matters do plants remove from the soil?

X. Name some serious defects in the agricultural practice of Southern India.

VETERINARY.

Sessional Examination—March 27th, 1877.

I. Why are animals warm?

II. What are the various tissues to be found in the leg of an animal?

III. What is the use of the arch of the vertebræ?

IV. What are tendons and ligaments, their uses, and of what tissues are they composed?

V. Which of the component parts of the blood are found in the serum?

VI. How do the bicuspid and tricuspid valves prevent the flow of the blood from the ventricles to the auricles?

VII. The capillaries which convey blood to the tissues being closed tubes, how do the tissues get their nutriment from the blood?

VIII. How is Expiration effected.

IX. What is the Alimentary canal?

X. What is Saliva; what its composition and uses, and how does it get into the mouth?

CHEMISTRY.

Sessional Examination—March 28th, 1877.

I. State the number of milligrams contained in 7·5 cubic centimeters of water at 0° C.

II. Equal volumes of Benzol and Glycerin weigh 102 and 147 grams respectively, and the specific gravity of the Benzol is 0·850; what is the specific gravity of the Glycerin?

III. Describe the method of taking the specific gravity of a light substance like wood.

IV. Write a description of the process of distillation by means of the apparatus known as Liebig's Condenser.

V. How is cane-juice converted into the solid substance—brown sugar? What circumstances would quicken the process of conversion?

VI. State briefly the law of gaseous volumes. Is there any difference between the molecular volume of Chlorine (Cl) and of the vapour of Acetic acid ($C_2 H_4 O_2$) the former a simple, and the latter a compound gas?

VII. What do you understand by quantivalence of an element? Illustrate your meaning in the following list of elementary substances:—

H; O; Cl; C; Zn.

VIII. What is the action of a stream of dry Hydrogen gas on heated Magnetic Oxide of Iron ($Fe_3 O_4$) placed in a suitable apparatus? Give reaction.

IX. Supposing 27 grams of pure water are completely decomposed by the voltaic current, what volume will the liberated gases—collected separately over each pole—occupy at 0° C. and 760 m. m. pressure? What will their respective weights be?

X. Describe the process for preparing Oxygen gas with Potassium chlorate. Show and explain decomposition.

XI. How is oxygen distinguished from other colourless gases? What is combustion?

XII. Read the following formulæ, and state what the figures and symbols in each case express:—

$H_2 = 2$; $O_2 = 32$; $Cl = 71$; $H_2 O = 18$; $H Cl = 36·5$; $H_2 SO_4 = 98$.

BOTANY.

Sessional Examination—March 29th, 1877.

I. Give some important points of difference between plants and animals.

II. What does Economic botany relate to?

III. Describe characters, having reference to leaves and flowers only, which distinguish *Dicotyledons* from *Monocotyledons*.

IV. Describe shapes assumed by stems.

V. Give examples of tubers.

VI. Describe the two varieties of bulbs, viz., tunicated and scaly, and give examples of each.

VII. State what you know about a runner, an offset, and a sucker.

VIII. Mention examples of hollow stems.

IX. Mention and explain terms used to describe condition of the surface of stems.

X. To what description of stems would you apply the terms fruticose and suffruticose?

ZOOLOGY.

Sessional Examination—April 4th, 1877.

I. Describe briefly the order Cheiroptera, and fully the structure of the wing of a bat.

II. Explain the terms Perissodactyla, Artiodactyla, Omnivora, Ruminantia, and give instances of animals under each of these heads.

III. State the various grounds on which the class Mammals is separated from that of Birds.

IV. Classify the following birds: Owl, crow, kite, pigeon, and peacock.

V. Describe the sternum, coracoid bone, scapula, and furculum of birds.

VI. Name the birds that are useful to the agriculturist, and state how they are useful to him.

VII. In what respect do the Dugong and Manatee differ from Whales.

VIII. Name all those Mammals that prove troublesome to the farmer.

IX. Name all those Mammals which are useful to man.

METEOROLOGY OF SOUTH CAROLINA FROM THE YEAR 1868 TO 1870.

South Carolina.

Year and Month.	Aiken.				Georgetown.				Fort Mill.				Camden.				Richburg.				Holland's Store.			
	Maximum Temperature.	Minimum Temperature.	Mean Temperature.	Rain and Melted Snow.	Maximum Temperature.	Minimum Temperature.	Mean Temperature	Rain and Melted Snow.	Maximum Temperature.	Minimum Temperature.	Mean Temperature.	Rain and Melted Snow.	Maximum Temperature.	Minimum Temperature.	Mean Temperature.	Rain and Melted Snow.	Maximum Temperature.	Minimum Temperature.	Mean Temperature.	Rain and Melted Snow.	Maximum Temperature.	Minimum Temperature.	Mean Temperature.	Rain and Melted Snow.
January 1868	75	23	49·0	2·00	65	12	38·0						68	22	47·7	2·82	78	32	55·1	2·45	76	32	54·1	2·36
Do. 1869	68	28	50·3	6·41																				
Do. 1870	77	28	49·1	2·84	66	18	47·1	4·45																
February 1868	65	26	34·6	3·34	64	18	38·0						69	19	47·0	4·45	76	32	54·0	2·20	68	16	46·0	6·98
Do. 1869	70	25	49·0	6·73	69	22	50·1																	
Do. 1870	70	15	46·6	2·77	68	16	44·1	4·45																
March 1868	84	32	55·8	3·21	82	24	52·9	2·28	74	16	45·9	2·36	74	16	45·0	2·36	78	32	55·7	5·30	78	25	51·6	10·10
Do. 1869	75	26	53·3	2·68	77	30	53·3	2·28																
Do. 1870	73	26	52·6	6·05	69	13	48·7	7·68	68	26	47·1													
April 1868	87	39	67·0	9·34	83	28	58·6						84	24	53·4	1·69	91	38	63·4	2·30	93	38	66·2	2·16
Do. 1869	84	34	62·9	5·03	88	35	59·2	2·21																
Do. 1870	91	34	61·8		90	35	62·9	3·82	84	38	62·2													
May 1868	97	36	69·8	6·42	89	60	68·8	2·67																
Do. 1869	91	48	67·8	1·19	89	62	68·0	3·65	90	62	70·3													
Do. 1870	91	60	72·9	1·92	90	62	76·3	3·65	90	62	70·3													
June 1868	93	63	74·1	2·46	89	60	74·7																	
Do. 1869	94	64	77·4	3·72	91	66	77·8	4·25																
Do. 1870	92	61	76·7	8·31		62	76·6	3·18	94	60	76·1													
July 1868	99	71	79·4		97	72	82·1																	
Do. 1869	101	68	81·4	5·26	99	69	82·7	2·05																
Do. 1870	96	70	82·7	2·26	94	71	82·3	2·74																
August 1868	90	65	76·2	6·49	90	66	77·6																	
Do. 1869	96	61	79·0	4·11	99	66	82·4	2·40																
Do. 1870	93	70	78·8	6·00 3·22	94	66	81·3	1·75																
September 1868	87	60	73·1	4·04	89	60	72·8																	
Do. 1869	87	51	71·2	1·79	90	61	73·3	1·77	90	60	71·2													
Do. 1870	88	54	71·0	3·00 0·83	86	63	73·8	2·05																
Do. 1870	87	68																						

METEOROLOGY OF SOUTH CAROLINA FROM THE YEAR 1868 TO 1870—(Continued).

Year and Month.	South Carolina.																							
	Aiken.				Gowdysville.				Fort Mill.				Camden.				Bluffton.				Holland's Store.			
	Maximum Temperature.	Minimum Temperature.	Mean Temperature.	Rain and Melted Snow.	Maximum Temperature.	Minimum Temperature.	Mean Temperature.	Rain and Melted Snow.	Maximum Temperature.	Minimum Temperature.	Mean Temperature.	Rain and Melted Snow.	Maximum Temperature.	Minimum Temperature.	Mean Temperature.	Rain and Melted Snow.	Maximum Temperature.	Minimum Temperature.	Mean Temperature.	Rain and Melted Snow.	Maximum Temperature.	Minimum Temperature.	Mean Temperature.	Rain and Melted Snow.
October 1868	79	42	..	3·57	82	37	62·0	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Do. 1869	76	36	59·9	1·37	78	33	59·2	2·37	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Do. 1870	80	49	65·3	4·40	..	..	..	..	..	..	..	..	..	..	..	..	86	56	71·6	8·40	..	..	..	..
November 1868	79	33	..	..	78	30	61·2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Do. 1869	71	30	47·4	2·76	67	27	47·5	3·85	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Do. 1870	78	29	52·7	2·11	70	27	52·1	2·59	..	..	..	..	..	..	..	..	86	39	60·9	4·20	..	..	..	..
December 1868	69	12	43·4	2·67	65	4	38·3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Do. 1869	67	30	47·1	4·58	68	22	43·6	0·97	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Do. 1870	75	10	43·7	1·53	69	7	41·6	5·10	..	..	..	..	..	..	..	..	68	18	48·4	5·20	..	..	..	..

AVERAGE MONTHLY METEOROLOGICAL REGISTRATIONS FOR THE FIVE YEARS ENDING 1875.

Months.	Barometer reduced to 32°.					Thermometer in Shade.												Rain.		Wind.			
	Highest in Month.	Lowest in Month.	Range in Month.	Mean Daily Range.	Mean for Month.	Highest in Month.	Lowest in Month.	Range in Month.	Mean Maximum.	Mean Minimum.	Mean Daily Range.	Mean Dry Bulb.	Mean Wet Bulb.	Relative Humidity.	Sun Maximum in Vacuo.	Maximum on Grass.	Amount Collected.	No. of Rainy Days.	Mean Daily Velocity.	General Direction.	Ozone.	Clear Sky.
Madras District.	Inches.	Inches.	Inches	Inches	Inches.	°	°	°	°	°	°	°	°	Cents.	°	°	Inches	Days.	Miles.	Points.	Cents.	Cents.
January	30·122	29·844	·278	·120	29·977	87·2	61·4	25·8	84·6	67·3	17·3	74·9	68·7	73	134·1	61·6	·15	2	142	N. E. by E.	47	66
February	30·100	29·819	·281	·124	29·951	91·3	64·0	27·3	86·6	68·9	17·7	77·0	70·9	74	133·5	63·9	2·19	2	128	N. E. by E.	44	70
March	30·060	29·743	·317	·133	29·898	95·1	65·1	30·0	89·4	71·7	17·7	79·8	73·4	74	135·4	67·4	1·18	2	159	S. E. by E.	43	80
April	29·986	29·637	·350	·133	29·817	101·1	72·8	28·4	92·9	77·3	15·6	83·9	77·0	74	137·2	74·4	·95	1	198	S. E.	42	71
May	29·909	29·458	·451	·123	29·730	105·2	74·4	30·8	97·4	80·1	17·3	86·0	77·3	68	138·3	78·3	2·50	2	233	S. by E.	44	64
June	29·880	29·538	·292	·121	29·693	104·0	74·7	29·3	97·7	80·4	17·3	86·3	75·7	62	133·8	78·6	2·08	9	223	S. S. W.	39	34
July	29·846	29·565	·281	·122	29·717	102·4	74·8	28·1	96·1	78·6	17·5	84·7	74·3	64	132·7	76·6	4·35	14	211	S. W.	41	27
August	29·892	29·605	·287	·124	29·747	99·2	73·5	25·7	93·9	77·3	16·6	83·4	75·4	70	134·2	75·4	4·43	14	179	S. W. by S.	44	36
September	29·911	29·599	·312	·185	29·763	99·0	72·4	26·6	92·8	76·8	16·0	82·8	75·7	72	136·1	74·7	4·78	13	160	...	38	38
October	29·984	29·654	·330	·119	29·633	96·3	70·5	25·8	87·9	75·0	12·9	77·8	75·2	81	131·9	72·3	12·61	16	119	N. W. by N.	41	37
November	30·059	29·772	·287	·113	29·932	90·1	67·5	22·5	84·8	73·0	11·8	77·7	73·2	81	131·3	69·8	18·08	17	174	N. N. E.	52	37
December	30·059	29·823	·275	·114	29·976	87·1	63·9	23·1	83·7	70·4	13·3	75·8	70·7	78	133·1	66·1	4·92	8	169	N. E.	52	52
Kurnool District.																						
January	29·182	28·864	·317	·150	29·009	94·3	55·8	38·5	89·7	61·6	28·1	74·6	62·6	52	137·0	57·4	·36	1	107	S. E. by E.	25	82
February	29·148	28·785	·364	·158	28·949	100·6	61·3	39·3	95·2	66·9	28·7	80·2	64·4	43	145·5	62·9	...	...	111	S. E. by S.	20	85
March	29·047	28·697	·350	·159	28·856	107·6	64·3	43·3	101·8	72·2	29·6	86·0	66·0	35	152·3	68·2	·33	1	120	S. E. by S.	8	82
April	29·038	28·686	·352	·171	28·853	110·2	71·6	38·7	105·6	78·7	26·9	90·7	69·8	36	158·0	85·5	·35	2	165	S. by W.	36	69
May	28·978	28·618	·360	·163	29·048	109·7	72·6	37·2	103·6	78·6	25·0	88·9	72·5	47	153·7	77·3	3·44	7	234	S. W.	23	48
June	28·910	28·618	·292	·139	28·779	103·4	71·5	31·9	96·1	76·0	20·3	84·1	73·3	61	142·2	74·9	3·82	10	369	W. S. W.	27	27
July	28·929	28·646	·283	·125	28·800	97·8	71·1	26·7	91·3	73·7	17·6	80·6	72·5	68	136·3	72·5	6·64	13	340	W. by S.	28	19
August	28·991	28·682	·310	·141	28·829	97·4	70·5	26·9	91·8	73·7	18·0	81·2	72·3	66	139·6	72·3	3·32	9	313	W. by S.	33	28
September	29·006	28·681	·325	·149	28·852	94·6	69·5	25·1	89·5	73·0	16·5	79·6	72·9	74	140·6	71·4	8·65	13	259	West.	33	26
October	29·090	28·762	·327	·139	28·803	96·0	64·3	31·8	90·2	71·7	18·6	79·3	71·5	69	140·0	68·7	3·62	7	155	...	37	42
November	29·163	28·851	·312	·145	29·022	93·0	59·0	34·0	88·8	66·9	[illegible]	[illegible]	[illegible]	61	137·3	62·8	·84	3	132	E. S. E.	33	59
December	29·212	28·899	·313	·151	29·057	92·2	56·6	35·6	88·1	63·3	24·8	74·5	64·7	59	135·8	59·6	·69	3	112	E. by S.	29	69
Masulipatam (Kistna District).																						
January	30·148	29·845	·304	·126	29·987	86·7	61·1	25·6	82·7	65·4	17·4	73·8	67·9	74	142·5	59·5	1·67	2	155	E. N. E.	53	66
February	30·123	29·791	·332	·129	29·949	92·2	63·1	29·1	86·0	68·0	17·9	76·8	70·2	72	145·5	62·3	·84	2	76	E. S. E.	42	68
March	30·067	29·734	·333	·131	29·886	97·5	66·8	30·7	90·3	72·3	18·0	80·3	73·8	74	146·7	67·1	3·06	2	175	...	56	65
April	29·988	29·599	·389	·133	29·798	104·9	72·5	32·5	94·8	77·8	16·7	84·6	77·4	73	150·0	73·7	·25	1	...	South.	49	58
May	29·878	29·461	·417	·134	29·695	110·3	74·5	35·8	98·5	81·1	17·4	87·5	78·6	68	152·5	78·3	1·19	6	...	S. S. W.	48	48
June	29·782	29·486	·296	·122	29·635	104·7	74·1	30·6	96·1	80·6	15·5	86·4	77·2	67	144·7	78·5	4·39	13	...	S. W. by W.	44	30
July	29·792	29·503	·290	·116	29·653	100·4	73·9	26·5	91·7	77·6	14·1	83·1	76·0	73	137·2	75·3	6·59	20	21	W. by S.	50	26

METEOROLOGY OF SOUTH CAROLINA FROM THE YEAR 1868 TO 1870—(Continued).

Year and Month.	South Carolina.																							
	Aiken.				Gowdysville.				Fort Mill.				Camden.				Bluffton.				Holland's Store.			
	Maximum Temperature.	Minimum Temperature.	Mean Temperature.	Rain and Melted Snow.	Maximum Temperature.	Minimum Temperature.	Mean Temperature.	Rain and Melted Snow.	Maximum Temperature.	Minimum Temperature.	Mean Temperature.	Rain and Melted Snow.	Maximum Temperature.	Minimum Temperature.	Mean Temperature.	Rain and Melted Snow.	Maximum Temperature.	Minimum Temperature.	Mean Temperature.	Rain and Melted Snow.	Maximum Temperature.	Minimum Temperature.	Mean Temperature.	Rain and Melted Snow.
October 1868	79	42	..	3·57	82	37	62·0	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Do. 1869	76	36	59·9	1·37	78	30	59·2	2·37	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Do. 1870	80	49	65·8	4·40	..	..	..	..	..	..	..	..	..	..	..	..	86	56	71·6	8·40	..	..	..	..
November 1868	79	33	..	..	78	30	51·2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Do. 1869	71	30	47·4	2·76	67	27	47·5	3·85	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Do. 1870	78	29	52·7	2·11	70	27	52·1	2·50	..	..	..	..	..	..	..	..	86	39	60·9	4·20	..	..	..	..
December 1868	69	12	42·4	2·67	65	4	38·3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Do. 1869	67	30	47·1	4·58	68	22	43·6	6·97	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Do. 1870	75	10	43·7	1·53	69	7	41·6	5·10	..	..	..	..	..	..	..	..	68	18	48·4	5·20	..	..	..	..

AVERAGE MONTHLY METEOROLOGICAL REGISTRATIONS FOR THE FIVE YEARS ENDING 1875.

Months.	Barometer reduced to 32°.					Thermometer in Shade.									Relative Humidity.	Sun Maximum in Vacuo.	Maximum on Grass.	Rain.		Wind.		Ozone.	Clear Sky.
	Highest in Month.	Lowest in Month.	Range in Month.	Mean Daily Range.	Mean for Month.	Highest in Month.	Lowest in Month.	Range in Month.	Mean Maximum.	Mean Minimum.	Mean Daily Range.	Mean Dry Bulb.	Mean Wet Bulb.					Amount Collected.	No. of Rainy Days.	Mean Daily Velocity.	General Direction.		
	Inches.	Inches.	Inches	Inches	Inches.	°	°	°	°	°	°	°	°	Cents.	°	°	Inches	Days.	Miles.	Points.	Cents.	Cents.
Madras District.																							
January	30·122	29·844	·278	·120	29·977	87·2	61·4	25·8	84·6	67·3	17·3	74·9	68·7	73	134·1	61·6	·15	2	142	N. E. by E.	47	66
February	30·100	29·819	·281	·124	29·951	91·3	64·0	27·3	86·6	68·9	17·7	77·0	70·9	71	133·5	63·9	2·19	2	128	N. E. by E.	44	70
March	30·060	29·743	·317	·133	29·898	95·1	65·1	30·0	89·4	71·7	17·7	79·8	73·4	74	135·4	67·4	1·18	2	159	S. E. by E.	43	80
April	29·986	29·687	·350	·133	29·817	101·1	72·8	28·4	92·9	77·8	15·6	83·9	77·0	74	137·2	74·4	·95	1	198	S. E.	42	71
May	29·909	29·458	·451	·123	29·730	105·2	74·4	30·8	97·4	80·1	17·3	86·0	77·3	68	138·3	78·3	2·50	2	233	S. by E.	44	64
June	29·880	29·538	·292	·121	29·693	104·0	74·7	29·3	97·7	80·4	17·3	86·3	75·7	62	133·8	78·6	2·08	9	223	S. S. W.	39	34
July	29·846	29·565	·281	·122	29·717	102·4	74·3	28·1	96·1	78·6	17·5	84·7	74·3	64	132·7	76·6	4·35	14	211	S. W.	41	27
August	29·892	29·605	·287	·124	29·747	99·2	73·5	25·7	93·9	77·3	16·6	83·4	75·4	70	134·2	75·4	4·43	14	179	S. W. by S.	44	36
September	29·911	29·599	·312	·135	29·763	99·0	72·4	26·6	92·8	76·8	16·0	82·8	75·7	72	136·1	74·7	4·78	13	160	...	38	38
October	29·984	29·654	·330	·119	29·633	96·3	70·5	25·8	87·9	75·0	12·9	77·8	75·2	81	131·9	72·3	12·61	16	119	N. W. by N.	41	37
November	30·059	29·772	·287	·113	29·932	90·1	67·5	22·5	84·8	73·0	11·8	77·7	73·2	81	131·3	69·8	18·08	17	174	N. N. E.	52	37
December	30·099	29·823	·275	·114	29·976	87·1	63·9	23·1	83·7	70·4	13·3	75·8	70·7	78	133·1	66·1	4·92	8	169	N. E.	52	52
Kurnool District.																							
January	29·182	28·864	·317	·150	29·009	94·3	55·8	38·5	89·7	61·6	28·1	74·6	62·6	52	137·0	57·4	·36	1	107	S. E. by E.	25	82
February	29·148	28·785	·364	·158	28·949	100·6	61·3	39·3	95·2	66·9	28·7	80·2	64·4	43	145·5	62·9	...	...	111	S. E. by S.	20	85
March	29·047	28·697	·350	·159	28·856	107·6	64·3	43·3	101·8	72·2	29·6	86·0	66·0	35	152·3	68·2	·33	1	120	S. E. by S.	8	82
April	29·038	28·686	·352	·171	28·853	110·2	71·6	38·7	105·6	78·7	26·9	90·7	69·8	36	158·0	85·5	·35	2	165	S. by W.	36	69
May	28·978	28·618	·360	·163	29·048	109·7	72·6	37·2	103·6	78·6	25·0	88·9	72·5	47	153·7	77·3	3·44	7	234	S. W.	23	48
June	28·910	28·618	·292	·139	28·779	103·4	71·5	31·9	96·1	76·0	20·3	84·1	73·3	61	142·2	74·9	3·82	10	369	W. S. W.	27	27
July	28·929	28·646	·283	·125	28·800	97·8	71·1	26·7	91·3	73·7	17·6	80·6	72·5	68	136·3	72·5	6·64	13	340	W. by S.	28	19
August	28·991	28·682	·310	·141	28·829	97·4	70·5	26·9	91·8	73·7	18·0	81·2	72·3	66	139·6	72·3	3·32	9	313	W. by S.	33	28
September	29·006	28·681	·325	·149	28·852	94·6	69·5	25·1	89·5	73·0	16·5	79·6	72·9	74	140·6	71·4	8·65	18	259	West.	33	26
October	29·090	28·762	·327	·139	28·803	96·0	64·3	31·8	90·2	71·7	18·6	79·3	71·5	69	140·0	68·7	3·62	7	155	...	37	42
November	29·163	28·851	·312	·145	29·022	93·0	59·0	34·0	88·8	66·9	[illegible]	[illegible]	[illegible]	61	137·3	62·8	·84	3	132	E. S. E.	33	59
December	29·212	28·899	·313	·151	29·057	92·2	56·6	35·6	88·1	63·3	24·8	74·5	64·7	59	135·8	59·6	·69	3	112	E. by S.	29	69
Masulipatam (Kistna District).																							
January	30·148	29·845	·304	·126	29·987	86·7	61·1	25·6	82·7	65·4	17·4	73·8	67·9	74	142·5	59·5	1·67	2	155	E. N. E.	53	66
February	30·123	29·791	·332	·129	29·949	92·2	63·1	29·1	86·0	68·0	17·9	76·8	70·2	72	145·5	62·3	·84	2	76	E. S. E.	42	68
March	30·067	29·734	·333	·131	29·886	97·5	66·8	30·7	90·3	72·3	18·0	80·3	73·8	74	146·7	67·1	3·06	2	175	...	56	65
April	29·988	29·599	·389	·133	29·798	104·9	72·5	32·5	94·8	77·8	16·7	84·6	77·4	73	150·0	73·7	·25	1	...	South.	49	58
May	29·878	29·461	·417	·134	29·695	110·3	74·5	35·8	98·5	81·1	17·4	87·5	78·6	68	152·5	78·3	1·19	6	...	S. S. W.	48	48
June	29·782	29·486	·296	·122	29·635	104·7	74·1	30·8	96·1	80·6	15·5	86·4	77·2	67	144·7	78·5	4·39	13	...	S. W. by W.	44	30
July	29·792	29·503	·290	·116	29·653	100·4	73·9	26·5	91·7	77·6	14·1	83·1	76·0	73	137·2	75·3	6·59	20	21	W. by S.	50	26

AVERAGE MONTHLY METEOROLOGICAL REGISTRATIONS FOR THE FIVE YEARS ENDING 1875—(*Continued*).

Months.	Barometer reduced to 32°.					Thermometer in Shade.								Relative Humidity.	Sun Maximum in Vacuo.	Maximum on Grass.	Rain.		Wind.		Ozone.	Clear Sky.
	Highest in Month.	Lowest in Month.	Range in Month.	Mean Daily Range.	Mean for Month.	Highest in Month.	Lowest in Month.	Range in Month.	Mean Maximum.	Mean Minimum.	Mean Daily Range.	Mean Dry Bulb.	Mean Wet Bulb.				Amount Collected.	No. of Rainy Days.	Mean Daily Velocity.	General Direction.		
Musulipatam (Kistna District)—(Continued).	Inches.	Inches.	Inches	Inches	Inches.	°	°	°	°	°	°	°	°	Cents.	°	°	Inches	Days.	Miles.	Points.	Cents.	Cents.
August	29·854	29·555	·299	·121	29·694	98·0	73·3	24·7	91·7	77·9	15·8	83·4	76·6	74	142·5	74·7	5·90	15	21	W. by S.	47	32
September	29·885	29·538	·347	·130	29·723	95·5	73·8	21·6	89·7	77·8	12·5	82·2	76·8	79	144·2	74·2	7·34	16	20	West.	48	36
October	29·988	29·614	·374	·115	29·718	93·8	70·8	23·0	87·0	75·7	11·2	80·4	75·4	79	139·8	72·5	11·05	15	14	N. by E.	48	40
November	30·087	29·769	·318	·116	29·952	87·7	66·9	20·8	83·9	71·4	12·5	77·3	71·8	77	142·6	67·4	3·87	5	20	N. E.	51	54
December	30·139	29·855	·284	·124	29·996	85·1	61·2	23·8	82·5	67·5	15·0	74·7	69·2	76	141·3	62·9	·26	2	30	N. E. by E.	49	61
Coimbatore District.																						
January	28·731	28·454	·277	·148	28·581	91·1	57·1	34·0	86·1	62·9	23·2	73·3	63·0	57	135·0	58·2	·33	3	77	E. N. E.	42	65
February	28·715	28·613	·302	·161	28·561	95·1	60·0	35·1	90·2	65·9	24·4	76·8	65·0	54	138·5	57·6	·47	3	82	E. N. E.	38	67
March	28·692	28·392	·300	·162	28·531	100·1	60·8	39·3	95·4	68·9	26·5	80·7	67·9	53	144·4	64·8	·58	2	87	E. S. E.	37	66
April	28·638	28·289	·345	·162	28·475	100·8	68·9	31·4	96·4	72·8	23·6	82·5	71·8	60	142·9	69·6	2·28	6	96	...	44	47
May	28·587	28·279	·289	·128	28·441	98·3	68·6	29·7	92·4	72·8	19·6	80·2	72·2	69	135·8	70·0	2·43	9	144	S. S. W.	45	36
June	28·543	28·289	·260	·96	28·428	95·1	68·0	27·1	87·9	71·4	16·6	77·4	70·2	71	130·1	69·5	2·55	11	211	S. W.	50	20
July	28·544	28·332	·212	·91	28·449	91·1	67·8	23·3	86·8	70·8	16·5	76·1	69·7	74	131·1	68·4	1·35	9	223	S. W.	50	22
August	28·581	28·327	·254	·113	28·460	93·2	68·3	22·9	88·3	70·6	17·7	76·9	70·3	73	136·2	68·6	·78	5	196	S. W.	44	26
September	28·595	28·345	·251	·129	28·470	91·9	67·7	24·2	88·3	70·3	18·0	77·1	70·1	77	139·0	68·3	1·54	7	188	S. W.	41	29
October	28·645	28·350	·295	·140	28·489	93·1	66·4	26·7	87·6	70·1	17·5	76·3	70·7	73	138·5	68·5	6·10	12	96	...	36	24
November	28·700	28·396	·304	·140	28·561	90·5	63·4	27·1	85·1	68·7	16·3	75·4	68·7	73	134·6	66·3	5·18	10	76	E. N. E.	37	28
December	28·737	28·445	·291	·142	28·592	88·8	57·3	31·1	84·9	65·1	19·7	73·6	65·7	66	134·5	61·5	·47	3	81	E. N. E.	38	46
Madura District.																						
January	29·622	29·346	·276	·138	29·478	91·5	61·7	29·7	87·3	67·0	20·2	76·3	68·5	68	135·4	60·7	1·10	3	131	N. E. by E.	57	58
February	29·592	29·319	·272	·145	29·460	95·0	63·6	31·4	90·5	68·3	22·2	78·4	69·6	65	137·4	62·1	1·21	3	121	...	73	58
March	29·578	29·254	·324	·158	29·419	100·5	64·3	36·2	94·1	71·4	24·5	82·1	71·6	60	141·8	65·9	2·95	3	92	E. S. E.	31	62
April	29·493	29·201	·291	·147	29·358	101·8	69·9	31·9	97·9	75·2	22·7	84·4	74·6	63	141·8	70·6	3·57	4	78	S. E. by S.	47	51
May	29·447	29·149	·298	·146	29·304	103·9	71·3	32·6	98·8	76·2	22·8	84·8	74·6	63	140·1	71·0	3·24	4	81	...	37	49
June	29·408	29·140	·268	·121	29·284	103·1	73·0	30·1	96·9	76·5	20·4	84·2	73·7	61	138·6	72·6	2·90	3	119	West	32	40
July	29·429	29·184	·245	·116	29·306	101·5	72·0	29·6	97·2	75·9	21·2	83·6	72·9	60	139·4	72·1	2·22	3	106	W. N. W.	49	42
August	29·453	29·178	·275	·124	29·320	101·7	70·7	31·0	96·6	75·4	21·2	83·3	73·5	63	140·3	71·8	4·92	7	77	W. by N.	54	44
September	29·458	29·200	·258	·145	29·333	100·0	71·6	28·5	95·3	74·6	20·6	82·4	73·5	66	141·5	70·8	3·55	8	74	W. N. W.	64	45
October	29·517	29·222	·296	·131	29·453	97·7	70·2	27·5	91·4	73·2	18·1	80·0	73·7	75	137·5	70·2	9·03	13	59	N. W. by N.	72	42
November	29·575	29·275	·300	·133	29·444	93·3	68·7	24·6	87·3	72·2	15·1	78·3	72·9	78	134·3	68·6	6·68	9	102	E. N. E.	68	42
December	29·603	29·340	·263	·127	29·482	89·9	64·4	25·6	86·0	69·5	16·5	76·5	70·9	76	135·2	64·6	2·04	5	116	E. N. E.	65	53

AVERAGE MONTHLY METEOROLOGICAL REGISTRATIONS FOR THE FIVE YEARS ENDING 1875—(*Continued*).

Months.	Barometer reduced to 32°.					Thermometer in Shade.								Relative Humidity.	Sun Maximum in Vacuo.	Maximum on Grass.	Rain.		Wind.		Ozone.	Clear Sky.
	Highest in Month.	Lowest in Month.	Range in Month.	Mean Daily Range.	Mean for Month.	Highest in Month.	Lowest in Month.	Range in Month.	Mean Maximum.	Mean Minimum.	Mean Daily Range.	Mean Dry Bulb.	Mean Wet Bulb.				Amount Collected.	No. of Rainy Days.	Mean Daily Velocity.	General Direction.		
Bellary District.	Inches.	Inches.	Inches	Inches	Inches.	°	°	°	°	°	°	°	°	Cents.	°	°	Inches	Days.	Miles.	Points.	Cents.	Cents.
January	28·653	28·338	·315	·148	28·482	94·5	55·0	39·6	88·9	60·3	28·6	72·8	60·1	48	135·3	56·2	·36	2	77	E. S. E.	41	79
February	28·623	28·310	·292	·152	28·453	98·1	52·9	39·6	94·5	65·8	28·7	78·6	63·2	43	141·6	62·7	·04	1	98	S. S. W.	38	82
March	28·571	28·266	·325	·154	28·404	106·2	65·1	41·0	101·0	71·2	29·9	84·6	64·5	33	151·7	67·7	·34	1	118	S. by E.	34	79
April	28·515	28·191	·324	·157	28·342	108·2	71·0	37·3	104·1	76·8	27·3	88·6	68·5	37	157·0	74·3	·65	3	136	S. by W.	36	66
May	28·460	28·140	·319	·152	28·300	107·0	69·8	37·2	101·3	76·4	24·9	86·5	70·8	48	154·6	74·9	2·93	8	208	W. N. W.	43	45
June	28·396	28·104	·292	·121	28·268	104·0	70·8	33·2	94·7	75·0	19·7	82·4	71·3	59	146·6	73·6	2·47	8	237	W. S. W.	46	25
July	28·404	28·155	·249	·109	28·290	97·2	70·9	26·3	91·0	74·0	17·0	80·0	70·3	63	141·5	73·0	1·47	8	283	West.	46	18
August	28·445	28·171	·274	·125	28·312	97·7	69·7	28·1	92·7	73·0	19·6	80·6	70·2	61	145·5	71·9	1·68	8	275	W. by N.	42	30
September	28·475	28·176	·299	·137	28·330	95·4	68·9	26·6	90·0	72·4	17·6	79·1	70·5	67	143·4	63·4	4·08	13	228	W. N. W.	44	23
October	28·551	28·216	·335	·135	28·381	94·9	64·9	29·9	89·4	70·7	18·0	78·1	71·1	65	139·9	67·9	5·51	12	110	...	44	32
November	28·620	28·335	·285	·136	28·477	92·5	58·4	34·1	87·9	65·4	22·5	75·1	65·2	60	137·6	61·4	1·16	4	76	E. N. E.	47	49
December	28·655	28·359	·296	·141	28·503	91·4	54·3	37·1	87·3	61·8	25·4	72·8	62·4	57	132·0	57·8	·11	2	75	E. by S.	51	62
Trichinopoly District.																						
January	29·851	29·546	·305	·148	29·574	91·0	60·8	28·3	86·9	66·5	20·4	75·3	67·7	68	136·2	61·0	1·06	3	153	N. E. by E.	33	65
February	29·817	29·522	·295	·148	29·672	95·3	63·5	31·9	90·8	68·7	22·0	78·3	67·7	65	138·5	63·0	2·64	4	130	E. N. E.	47	69
March	29·787	29·466	·321	·165	29·647	101·1	64·9	36·2	96·4	71·9	24·5	82·5	71·5	59	142·2	66·4	·07	1	121	S. E. by E.	32	76
April	29·716	29·362	·354	·157	29·552	104·2	72·2	32·0	98·9	77·3	21·6	86·0	74·9	60	143·0	74·0	1·50	3	144	...	...	45
May	29·688	29·332	·355	·146	29·515	106·4	74·0	32·3	100·6	78·5	22·1	87·3	75·1	57	140·3	76·0	2·39	5	198	W. by S.	...	45
June	29·603	29·299	·304	·122	29·465	102·1	74·8	27·3	97·2	78·3	18·9	85·4	73·6	57	135·0	76·7	1·79	6	356	West.	17	20
July	29·663	29·337	·265	·122	29·479	99·6	73·7	26·0	96·1	77·5	18·6	84·6	73·0	57	134·8	75·8	2·16	4	360	W. by N.	23	20
August	29·644	29·336	·308	·138	29·499	99·9	72·5	27·5	95·4	76·5	19·0	83·8	73·2	61	135·6	74·8	3·88	9	264	West.	26	21
September	29·655	29·350	·305	·153	29·512	98·5	72·1	26·5	94·0	75·8	18·2	82·9	73·3	64	136·6	73·9	5·14	9	243	W. by N.	28	21
October	29·763	29·397	·306	·142	29·546	95·5	69·5	26·1	89·5	73·5	16·0	79·9	73·7	75	134·5	71·3	6·05	15	125	N. W. by W.	31	22
November	29·767	29·480	·287	...	29·637	90·1	68·6	21·5	85·9	72·3	13·6	77·5	72·6	79	133·3	68·9	5·69	11	146	N. E. by N.	34	27
December	29·815	29·540	·275	·131	29·682	89·4	63·0	26·3	85·1	69·2	15·8	75·6	69·8	75	133·1	65·2	1·97	5	158	N. E. by N.	41	47
Nogapatam (Tanjore District).																						
January	30·096	29·828	·268	·121	29·959	84·9	64·1	20·8	82·5	70·3	12·1	76·4	71·1	78	144·9	66·9	2·16	4	148	N. E.	84	64
February	30·078	29·804	·274	·127	29·941	86·9	66·2	20·7	84·4	72·1	12·3	78·1	72·2	75	143·6	68·8	2·74	3	110	East.	77	67
March	30·050	29·754	·296	·136	29·900	93·3	67·9	26·4	88·3	75·6	12·7	81·4	75·1	75	146·0	71·2	1·16	1	107	S. E. by E.	63	78
April	29·984	29·667	·318	·136	29·824	100·0	72·7	27·3	92·8	78·5	14·3	84·3	78·0	76	147·4	75·0	2·39	3	135	S. E. by S.	59	73
May	29·918	29·574	·344	·128	29·759	103·6	71·9	31·6	96·5	78·6	17·9	85·0	77·6	72	146·0	75·9	1·74	3	190	...	61	67
June	29·856	29·574	·282	·123	29·728	102·7	74·5	28·1	97·8	78·8	19·0	85·3	76·3	67	144·4	75·9	1·13	4	207	S. W.	71	57
July	29·871	29·601	·271	·125	29·750	101·6	74·0	27·6	97·2	78·0	19·2	84·2	75·5	67	144·9	75·5	2·05	6	201	S. W.	67	56

AVERAGE MONTHLY METEOROLOGICAL REGISTRATIONS FOR THE FIVE YEARS ENDING 1875—(*Continued*).

Months.	Barometer reduced to 32°.					Thermometer in Shade.					Rain.		Wind.		Ozone.	Clear Sky.
	Highest in Month.	Lowest in Month.	Range in Month.	Mean Daily Range.	Mean for Month.	Highest in Month.	Lowest in Month.	Range in Month.	Mean Maximum.	Mean Minimum.	Mean Daily Range.	Mean Dry Bulb.	Mean Wet Bulb.	Relative Humidity.	Sun Maximum in Vacuo.	Maximum on Grass.	Amount Collected.	No. of Rainy Days.	Mean Daily Velocity.	General Direction.	
Negapatam, (Tanjore District)—(Continued).	Inches.	Inches.	Inches.	Inches.	Inches.	°	°	°	°	°	°	°	°	Cents.	°	°	Inches.	Days.	Miles.		Cents.	Cents.
August	29·738	29·635	·979	·129	29·776	99·2	74·1	25·1	84·7	77·3	17·4	83·1	76·0	73	144·9	74·6	3·69	7	158	Points.	63	54
September	29·928	29·648	·279	·143	29·786	97·9	72·6	25·3	83·4	76·7	16·7	82·3	75·8	74	146·3	74·0	4·73	4	151	E. W.	64	32
October	29·990	29·672	·319	·132	29·824	97·8	71·8	24·0	84·7	76·5	13·8	80·7	75·1	80	143·1	73·3	7·06	13	112	S. W.	47	47
November	30·046	29·763	·283	·121	29·915	99·4	70·6	19·8	84·7	74·3	10·4	78·4	74·1	82	137·6	72·1	10·76	19	172	S. W. by N.	76	49
December	30·085	29·818	·266	·117	29·967	88·8	67·0	19·8	82·6	72·9	9·7	76·9	75·1	79	139·1	69·8	5·91	8	177	N. E.	72	20
Salem District.																						
January	29·906	29·736	·259	·155	29·040	97·3	58·3	32·0	87·2	64·7	22·4	75·2	66·1	62	144·1	67·3	·25	1	117	E. N. E.	57	60
February	29·177	28·870	·307	·163	29·017	97·9	60·9	37·0	88·0	66·8	21·2	78·8	67·9	67	145·8	67·4	·43	2	133	E. by N.	51	52
March	29·145	28·815	·330	·171	28·975	108·4	61·8	42·1	96·3	70·7	25·6	83·3	69·6	51	147·5	66·1	·50	2	128	S. E. by E.	40	66
April	29·086	28·734	·352	·172	28·912	104·2	69·9	34·3	100·0	75·4	24·6	86·7	74·1	56	157·4	71·5	3·13	7	108	S. E.	58	56
May	29·217	28·688	·529	·146	28·871	103·3	69·6	31·7	97·8	75·7	22·1	84·7	73·3	62	149·9	72·4	6·01	8	111	S.	58	35
June	28·960	28·681	·299	·134	28·864	100·0	71·0	28·9	94·7	74·4	20·3	82·4	72·6	69	135·7	70·2	2·33	3	129	S. W. by W.	33	33
July	28·993	28·727	·266	·126	28·875	98·7	71·1	27·6	93·0	73·0	20·0	80·7	72·6	71	139·4	70·2	4·20	13	130	S. W.	36	36
August	29·039	28·746	·293	·139	28·903	97·6	69·8	28·8	92·0	73·0	19·0	80·4	73·1	78	141·9	69·3	5·16	16	98	S. W. by W.	40	40
September	29·039	28·753	·286	·150	28·903	95·6	69·8	25·8	85·6	72·4	19·0	78·5	73·1	78	133·6	69·0	6·36	12	96	W. S. W.	38	38
October	29·092	28·787	·305	·144	29·111	98·4	66·7	29·7	89·0	72·0	16·8	78·8	70·7	74	141·2	65·9	9·25	15	59	W. by W.	34	34
November	29·149	28·870	·279	·134	29·014	99·0	62·8	36·2	87·1	69·3	17·8	78·8	70·7	74	143·4	65·9	2·89	10	83	N. E. by E.	44	51
December	29·191	28·895	·295	·132	29·047	90·2	58·6	31·6	85·6	69·9	15·7	75·1	67·6	68	141·4	60·6	·78	4	100	E. N. E.	49	65

MADAGASCAR PADDY.

PROCEEDINGS of the BOARD OF REVENUE, dated 4th October 1877, No. 4,633.

Read the following letter from W. R. ROBERTSON, Esq., M.R.A.C., Superintendent of Government Farms, to C. A. GALTON, Esq., Acting Secretary to the Board of Revenue, dated Sydapet, 21st September 1877, No. 820:—

WHEN preparing my report on the Carolina paddy experiments of this Presidency, I had occasion to search through many American publications for information regarding the early history of that paddy, and while so engaged I frequently met with statements to the effect that the Carolina paddy is the descendant of paddy imported into America from Madagascar.

2. It being a matter of some importance, in connection with the improvement of the rice of this country, to determine whether Madagascar now possesses any varieties of paddy of a class so high as that from which the Carolina paddy must have originated, I obtained, through the kindness of the Reverend Mr. Organe of Madras, the address of the Reverend Mr. Toy, a Missionary residing in Madagascar, and I asked that gentleman to be good enough to procure and forward to Madras samples of the different varieties of paddy grown in Madagascar.

3. The samples of paddy have just reached me; they represent five varieties, but only one appears to merit special attention; it is that of the paddy known in Madagascar as Rojofotsy. I enclose a sample of this paddy and a sample of its rice. It will be noted that the grain is very large. For comparison I also enclose samples of Carolina paddy and rice.

4. On comparing the two varieties of paddy, it will be observed that the grain of the Madagascar variety is considerably the largest. I find that, while 846 grains of the former weigh one ounce, it requires 990 grains of the latter to make up the same weight. The Carolina paddy is a very good sample and quite as large in the grain as when first imported into this country. Had the Rojofotsy paddy been as well cultivated as the Carolina paddy, the grain would have looked much better; only a portion of it appears to have been properly matured. Both varieties of paddy contain an admixture of paddy that yields a red rice. It can scarcely be said that this proves their common origin, for it frequently happens that red rice is mixed with white rice. The red rice which is found in America amongst Carolina rice may have been as readily introduced into that country in Indian seeds as in Madagascar seed.

5. On comparing the rice of the two varieties of paddy, it will be observed that the Carolina rice is smaller, though whiter, plumper, and more starchey than that of the Rojofotsy paddy. From a small experiment I made, I found that, while the Carolina paddy yielded 79·79 per cent. of rice, the Rojofotsy yielded only 76·46 per cent. by weight. The lesser yield of rice from the Madagascar paddy was due, I think, to many of the grains being imperfect, for, as I have already noticed, the perfectly formed grain is heavier than the grain of Carolina paddy of equal quality. The two samples are not, of course, of equal commercial value for export purposes, but for local consumption I would consider the Madagascar rice is quite equal to the Carolina rice.

6. I possess no information regarding the habit of the plant that produces the Rojofotsy paddy. It is, of course, quite possible that the crop may be unsuited for introduction into this country from being long in reaching maturity, or for other reasons. It seems, however, desirable that further inquiries should be instituted.

7. It seems not improbable but that the Rojofotsy paddy may be the variety from which the Carolina paddy was descended. The color of its husk is certainly not that rich golden color which now is so characteristic of the Carolina paddy seed, but the color of the husk may have become gradually darker in America. However, after growing a crop of the Rojofotsy I will be better able to form an opinion on this matter.

8. If Madagascar cannot supply a variety of paddy suited for introduction into this country in view to its cultivation, that Island may perhaps be able to afford a supply of paddy which, at the present crisis, might prove highly acceptable as food in this country.

APPENDICES

TO

THE GENERAL REPORT.

EXPENDITURE OF THE MADRAS AGRICULTURAL DEPARTMENT.

	Rs.	A.	P.	Rs.	A.	P.
I. General Supervision—						
Establishment	18,628	5	2			
Travelling allowance	317	6	0			
Contingencies	740	4	1	19,685	15	3
II. Sydapet Experimental Farm—						
Establishment	1,772	10	1			
Cooly labor	4,752	9	8			
Implements and machines	1,817	2	2			
Live stock	742	4	0			
Seeds	637	15	0			
Food for live stock	1,809	12	2			
Manure	927	9	9			
Despatching seeds	279	2	8			
Contingencies	278	9	0	12,517	10	6
III. Implement Workshops—						
Carpenters, Smiths and Filer	875	5	1			
Cooly labor	191	5	7			
Machines, implements and materials	879	13	4	1,946	8	0
IV. Educational—						
Sydapet Farm Apprentices	1,146	10	8			
Books for Library	156	14	0			
Contingencies	52	12	0			
School of Agriculture—						
Masters, Clerk and other servants	1,225	2	9			
Draftsman	97	3	0			
Lecture fees	1,620	0	0			
Furniture	1,492	11	0			
Accommodation	769	14	3			
Contingencies	389	14	2	6,951	1	10
V. Estate improvements—						
Repairs to buildings	1,655	1	1			
Water-channels	1,119	8	2			
Tress and planting	74	6	6			
Levelling the surface of dry land to be brought under wet cultivation	228	11	0			
Contingencies	123	11	9			
Manufacture of drain pipes and subsoil drainage	704	0	7			
Brick and mortar bridges under main roads ...	100	13	9			
Repairs to bridges	100	4	8			
Constructing level road way through the nullah between the Experimental and Model Farms,	166	5	6			
Constructing weirs to protect river banks ...	91	11	6			
Retiling Cattle-sheds	192	8	10			
Levelling in plantation occupied by Wudders ...	101	2	0			
Repairs to roads	458	4	1			
Sinking wells	109	3	10			
Construction of implement sheds	502	5	3			
Do. of food-preparing sheds	243	14	4			
Do. of cattle food stores	401	12	0	6,373	12	10
VI. Other charges—						
Paid Public Works Workshops and Pier Toll by transfer	145	9	6			
Paid Commissariat Department for cattle by transfer	490	0	0			
Paid value of, and freight on 28 Swedish ploughs, and one seed microscope, by transfer.	910	6	3			
Paid Veterinary Surgeon W. S. Adams by transfer	798	11	4	2,344	11	1
			Total ...	49,819	11	6

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	389	14	2	6,961	1	10
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			Total ...	49,812	11	0

much lower rate of expenditure than is obtainable, even with the most careful management, on a Government Farm, and the difference they may reasonably look to saving must be credited to the profit side before the net returns that may be expected in private enterprise can be fairly calculated.

8. The report of the year just ended will shortly be looked for, and it is hoped will give a favorable account of the progress of the institution of which the report under notice records the satisfactory commencement.

9. Some papers are printed with the annual report—on "the Carolina Paddy experiments in the Madras Presidency," "the growth of forage for live-stock," "the pernicious effects of the use of cattle-dung as fuel," &c. By placing the report on the Editor's table an opportunity will be given for the dissemination of the information they contain.

10. The classified financial information, the absence of which from the last report was noticed by the Secretary of State, is not to be found in this report either, but the Superintendent has been asked to report on the matter with reference to paragraph 2 of G.O., dated 2nd April 1878, No. 519.

(A true Copy and Extract.)

(Signed) J. STURROCK,
Acting Sub-Secretary.

ORDER THEREON, 23rd July 1878, No. 1,148.

THE Board forward the report of the Superintendent of Government Farms for 1876-77. This embraces an account of some of the year's operations on the Sydapet Farm, a report on the progress of the School of Agriculture opened in October 1876, and some papers on agricultural topics drawn up by the Superintendent himself or the farm officers.

2. A history of the various experiments made during the last 7 or 8 years in the cultivation of Carolina paddy is also appended, with notes on the habits and customs of this plant in America. These last have already been submitted to Government in a separate form, and the School of Agriculture having its place in the general report of the Director of Public Instruction will not be noticed here.

3. In the report on the season at Sydapet there is some instructive information as to the rainfall, which in any one month of the last seven years has but rarely approximated the average deduced from sixty years' observations at the Observatory, which is only about 3 miles distant.

4. In 1876 the rainfall seems to have been fairly sufficient until the second week of September, but its subsequent failure during the north-east monsoon was very marked and appears to have been altogether insufficient to admit of wet crops being raised. This being the chief cultivating season in the district in which the farm is situated, the methods of cultivation adopted on the latter were subjected to a crucial test. In the case of the crops reported on the result was highly gratifying, for deep cultivation and high manuring secured a fair outturn, and one that, with straw and grain at famine prices, was distinctly remunerative. How much this result was due to deep cultivation is demonstrated by the contrast worked out between the yield on the body of the fields and that on the head lands where the cultivation was shallower, though not more so than in the ordinary practice of the country.

Paragraph 39.

Paragraph 31.

5. The dry crops planted in October had a rainfall of about 5 inches on 12 or 14 days, while a crop sown in November had only 1·71 inches on 6 days, and another, put down in December, only ·16 inches on 3 days.

It is noteworthy that the yield of straw in the last two cases was on a par with that of the crops that received more rain, but that the grain outturn was small.

Deep cultivation is also reported to have secured very satisfactory growth in the case of the cotton and indigo crops, but the final results will not appear until next year's report

6. In the matter of special crops it is noted that of five carob trees which had been planted eleven years, one has at last fruited, and that it is believed that it is the only female plant. Grafting the seedlings of this tree from known male or female plants is accordingly recommended.

7. No mention is made of the buffalo grass which was favorably reported on last year. The results of further experience in its cultivation should be noticed in next report. The Government also hope that the proposed* experiment to induce New Orleans cotton to alter its bearing season will not be lost sight of.

* Paragraph 151, Report for 1875-76.

8. In paragraphs 77 to 85 are recorded the results of some topdressing experiments made with saltpetre and bone charcoal on land sown with yellow cholum, but the dry season is said to have been unfavorable to the use of the former. The gain directly traceable to its use was not sufficient to repay the outlay, but it is hoped that the soil was permanently improved to the benefit of future crops. Bone charcoal is believed to be useless as a topdressing when used by itself, but further experience seems needed to place the matter beyond doubt.

9. In last year's report it was stated that indifferent results had been obtained in growing ground-nuts, and it was suggested that this was due to a want of lime in the soils of the farm. This conjecture is now shown to have been correct, for a crop of ground-nuts manured with lime gave an abundant yield. The general use of this manure is however not recommended as its stimulating qualities render it of dangerous utility in the hands of the ignorant or shortsighted cultivator.

10. The stock breeding experiment has been delayed from several causes, but the flock of sheep kept on the farm has thriven well. The loss was exceptionally small, and this is attributed to the absence of the rank grasses that spring up with an abundant rainfall. The quality of wool improved, but the yield per head was less, though found to be fair for the weight of the sheep.

11. The Government note that the Board have called for a report in regard to the financial statement desired by the Secretary of State. In this the farm accounts should be kept distinct from those of the School of Agriculture.

12. The Board further remark that portions of the farm report are devoted to conveying advice on various topics which are not directly illustrated by reference to any particular operations on the farm. These remarks they consider would find a more appropriate place in a manual of agriculture, and in this view the Government concur. The preparation of such a manual is a work that may well engage the early attention of Mr. Robertson and his Assistants, and much of the requisite matter is to be found in the interesting papers which accompany the present report.

13. The report on the farm should deal only with its working, but should show clearly and in sufficient detail what was done and left undone—the total extent, the area under wet and dry cultivation, the extent of grazing lands, &c., &c., and the financial results. From the present report the Government are unable to gather how far lands were left uncultivated or crops lost, or how the stock was maintained, and desire that the Superintendent will, if possible, supply this information at once. The record of the experiments made in cultivation and with special crops is useful and interesting, and should of course be continued, but the plan on which the whole operations are being conducted, and how far it was successful or the reverse, should also be shown, as well as the extent to which the deeper cultivation had been rendered possible or aided by artificial raising of the soil.

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The Government cannot expect that the farm should be directly profitable, being used for experiments which may or may not succeed, but they wish to make it really

much lower rate of expenditure than is obtainable, even with the most careful management, on a Government Farm, and the difference they may reasonably look to saving must be credited to the profit side before the net returns that may be expected in private enterprise can be fairly calculated.

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(A true Copy and Extract.)

(Signed) J. STURROCK,
Acting Sub-Secretary.

ORDER THEREON, 23rd July 1878, No. 1,148.

THE Board forward the report of the Superintendent of Government Farms for 1876-77. This embraces an account of some of the year's operations on the Sydapet Farm, a report on the progress of the School of Agriculture opened in October 1876, and some papers on agricultural topics drawn up by the Superintendent himself or the farm officers.

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3. In the report on the season at Sydapet there is some instructive information as to the rainfall, which in any one month of the last seven years has but rarely approximated the average deduced from sixty years' observations at the Observatory, which is only about 3 miles distant.

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Paragraph 39.

Paragraph 31.

5. The dry crops planted in October had a rainfall of about 5 inches on 12 or 14 days, while a crop sown in November had only 1·71 inches on 6 days, and another, put down in December, only ·16 inches on 3 days.

It is noteworthy that the yield of straw in the last two cases was on a par with that of the crops that received more rain, but that the grain outturn was small.

Deep cultivation is also reported to have secured very satisfactory growth in the case of the cotton and indigo crops, but the final results will not appear until next year's report

6. In the matter of special crops it is noted that of five carob trees which had been planted eleven years, one has at last fruited, and that it is believed that it is the only female plant. Grafting the seedlings of this tree from known male or female plants is accordingly recommended.

7. No mention is made of the buffalo grass which was favorably reported on last year. The results of further experience in its cultivation should be noticed in next report. The Government also hope that the proposed* experiment to induce New Orleans cotton to alter its bearing season will not be lost sight of.

* Paragraph 151, Report for 1875-76.

8. In paragraphs 77 to 85 are recorded the results of some topdressing experiments made with saltpetre and bone charcoal on land sown with yellow cholum, but the dry season is said to have been unfavorable to the use of the former. The gain directly traceable to its use was not sufficient to repay the outlay, but it is hoped that the soil was permanently improved to the benefit of future crops. Bone charcoal is believed to be useless as a topdressing when used by itself, but further experience seems needed to place the matter beyond doubt.

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10. The stock breeding experiment has been delayed from several causes, but the flock of sheep kept on the farm has thriven well. The loss was exceptionally small, and this is attributed to the absence of the rank grasses that spring up with an abundant rainfall. The quality of wool improved, but the yield per head was less, though found to be fair for the weight of the sheep.

11. The Government note that the Board have called for a report in regard to the financial statement desired by the Secretary of State. In this the farm accounts should be kept distinct from those of the School of Agriculture.

12. The Board further remark that portions of the farm report are devoted to conveying advice on various topics which are not directly illustrated by reference to any particular operations on the farm. These remarks they consider would find a more appropriate place in a manual of agriculture, and in this view the Government concur. The preparation of such a manual is a work that may well engage the early attention of Mr. Robertson and his Assistants, and much of the requisite matter is to be found in the interesting papers which accompany the present report.

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The Government cannot expect that the farm should be directly profitable, being used for experiments which may or may not succeed, but they wish to make it really

beneficial, and believe that this end may best be secured by subjecting its entire practice to public criticism.

14. In connection with this point the Governor in Council learns with satisfaction that the Superintendent's correspondence on agricultural matters is increasing and that information is offered as well as sought. This fact and the numerous applications for admission to the School of Agriculture evidence a growing desire for an improved agriculture, which must be a source of well-founded satisfaction to the Superintendent and his Assistants, and is in a great measure the fruit of their zealous and intelligent efforts.

15. The Government consider that the papers contributed to this report by Messrs. Benson and Schiffmayer reflect much credit on those officers, and Mr. Robertson himself has done well in calling attention to some neglected manural substances, though the inference as to the high death-rate of farm stock drawn by him from the Customs House returns of exported hides and skins is based on incorrect premises, large consignments of both skins and hides being regularly sent down by rail from both Bengal and Bombay to this Presidency to be cured and exported, as the product of Madras tanneries.

16. The Superintendent will submit his report for 1877-78 with the least possible delay, and his annual report will in future be despatched to the Board of Revenue not later than the 30th June.

(True Extract.)

(Signed) C. G. MASTER,
Secretary to Government.

No. 1,324.

PROCEEDINGS OF THE BOARD OF REVENUE, dated 16th May 1878.

Read the following letter from W. R. ROBERTSON, Esq., M.R.A.C., Superintendent of Government Farms, to H. E. STOKES, Esq., Secretary to the Board of Revenue, dated Sydapet, 22nd December 1877, No. 1,085 :—

I HAVE the honor to submit my annual report for the official year ending 31st of March 1877. A report on the results of the experimental culture of Carolina paddy in this Presidency forms a part of the annual report; this portion has however, in accordance with the directions of the Board, been already separately submitted.

2. As directed in the Proceedings of the Board, Miscellaneous No. 3,076, dated the 5th of June 1877, I forwarded to the Director of Public Instruction a copy of the portion of the report that refers to the Agricultural College.

ENCLOSURE No. 1.—Report on Government Farms.

THE report of the Superintendent of the Government Farms for the year 1876-77 will be forwarded for the consideration of Government.

2. The most important fact mentioned in the report is that the Agricultural College was opened in October 1876, and it is gratifying to learn that numerous applications for admission were received by the Superintendent from all parts of India and in many instances from well educated youths whose training in scientific agriculture may be expected to have considerable effect on the progress of agricultural improvement throughout the country.

3. A reference to the statement shows that twenty-seven agricultural students were under education in the winter session ending March 1877; and judging from the marks awarded, it would appear that many did well and some very well at the weekly examinations throughout the course.

4. It is also very satisfactory to know that persons engaged in agriculture are increasingly communicating with the farm authorities with a view to obtain practical information on matters appertaining to their particular pursuits. Mr. Robertson is encouraging such inquiries, and will doubtless give attention to the best means of making public the information collected and conveyed on these occasions in such manner that it may be as practically and extensively useful as possible.

5. On the farm itself the drought interfered with ordinary operations, but the advantages of deep ploughing were all the more clearly shown.

6. There is much useful information to be found in the report, and many suggestions which the Board hope may gradually find their way to the agriculturists of the country and be adopted by them. But it must be observed that there is a great deal both of information and advice—excellent in itself and much practical import if appreciated—that would find fitting place in a manual of agriculture, but that is somewhat out of place in an annual report of the working of a department. The Board by no means think the way [illegible] of agricultural science are so well known that their exposition and repetition are unnecessary; but this should be reserved for separate papers, or appendices that may be published in District Gazettes, &c., independently, and the annual report, in its body at least, should be confined to showing the operations and progress of the department for the year under notice. For example, paragraphs 10 to 29 discuss general questions of rotation and courses of crops. They state no results obtained on the farm. They are generally instructive, but are not descriptive of experiences as paragraphs 30, 31, &c., paragraphs 39, 40, &c., distinctly are. Such remarks should be omitted or very sparingly introduced in annual reports in future. How information of the sort can be best brought home to the classes who will benefit themselves and the State by applying it in practice is a question which must engage the Board's attention, but it is one which they will be in a

better position to consider satisfactorily after the receipt of the orders of Government on the Proceedings relating to the question of agricultural education generally in this Presidency (*vide* Board's Proceedings, dated 13th December 1877, No. 5,223).

7. The Board consider carefully prepared statements of the particulars of the cultivation of certain areas with specified crops in the year to be very valuable, and that analyses of the results of such experiments are most fitting in the report of the year's work. Of course, the utmost attention should be paid to economical working in these experiments, not only on general considerations, but that the advantages of the system pursued and recommended may be as apparent as possible. It should not be lost sight of however in considering results that in the circumstances of a Government Farm the net returns in particular cases cannot be made the test of the advantages or disadvantages of a system advocated on scientific principles. Private agriculturists will undoubtedly be able to work on the same principles at a very much lower rate of expenditure than is obtainable, even with the most careful management on a Government Farm, and the difference they may reasonably look to saving must be credited to the profit side before the net returns that may be expected in private enterprise can be fairly calculated.

8. The report of the year just ended will shortly be looked for, and it is hoped will give a favorable account of the progress of the institution of which the report under notice records the satisfactory commencement.

9. Some papers are printed with the annual report—on "the Carolina Paddy experiments in the Madras Presidency," "the growth of forage for live stock," "the pernicious effects of the use of cattle dung as fuel," &c. By placing the report on the Editor's table an opportunity will be given for the dissemination of the information they contain.

10. The classified financial information, the absence of which from the last report was noticed by the Secretary of State, is not to be found in this report either, but the Superintendent has been asked to report on the matter with reference to paragraph 2 of G.O., dated 2nd April 1878, No. 519.

(A true Copy and Extract.)

Acting Sub-Secretary.

To the Secretary to Government, Revenue Department,
with Farm Report.
Superintendent of Government Farms.

Exd. W. J. Lewis.

Revenue Dept. G.O. 2-4-78 No. 519

Received 24/5/78

Read 27th May 1878

BOARD OF REVENUE.
1878.
MADRAS.

PROCEEDINGS, 16TH MAY 1878, No. 1,324.

Read

MAY.
No. 1,324.

Government Farms.—Reviewing and submitting to Government Annual Report on operations of — for 1876-77.

Proof for Under Secy's approval

1148/86

GOVERNMENT OF MADRAS.

REVENUE DEPARTMENT.

23rd July 1878, No. 1,148.

Read the following paper :—

No. 292. Proceedings of the Board of Revenue, dated 16th May 1878, No. 1,324.

Read the following letter from W. R. ROBERTSON, Esq., M.R.A.C., Superintendent of Government Farms, to H. E. STOKES, Esq., Secretary to the Board of Revenue, dated Sydapet, 22nd December 1877, No. 1,085 :—

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2. As directed in the Proceedings of the Board, Miscellaneous No. 8,076, dated the 5th of June 1877, I forwarded to the Director of Public Instruction a copy of the portion of the report that refers to the Agricultural College.

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THE report of the Superintendent of the Government Farms for the year 1876-77 will be forwarded for the consideration of Government.

2. The most important fact mentioned in the report is that the Agricultural College was opened in October 1876, and it is gratifying to learn that numerous applications for admission were received by the Superintendent from all parts of India and in many instances from well educated youths whose training in scientific agriculture may be expected to have considerable effect on the progress of agricultural improvement throughout the country.

3. A reference to the statement shows that twenty-seven agricultural students were under education in the winter session ending March 1877; and judging from the marks awarded, it would appear that many did well and some very well at the weekly examinations throughout the course.

4. It is also very satisfactory to know that persons engaged in agriculture are increasingly communicating with the farm authorities with a view to obtain practical information on matters appertaining to their particular pursuits. Mr. Robertson is encouraging such inquiries, and will doubtless give attention to the best means of making public the information collected and conveyed on these occasions in such manner that it may be as practically and extensively useful as possible.

5. On the farm itself the brought interfered with ordinary operations, but the advantages of deep ploughing were all the more clearly shown.

6. There is much useful information to be found in the report, and many suggestions which the Board hope may gradually find their way to the agriculturists of the country and be adopted by them. But it must be observed that there is a great deal both of information and advice—excellent in itself and of much practical import if appreciated—that would find fitting place in a manual of agriculture, but that is somewhat out of place in an annual report of the working of a department. The Board by no means think the very elements of agricultural science are so well known that their exposition and repetition are unnecessary; but this should be reserved for separate papers, or appendices that may be published in District Gazettes, &c., independently, and the annual report, in its body at least, should be confined to showing the operations and progress of the department for the year

1148/87

under notice. For example, paragraphs 10 to 29 discuss general questions of rotation and courses of crops. They state no results obtained on the farm. They are generally instructive, but are not descriptive of experiences as paragraphs 30, 31, &c., paragraphs 39, 40, &c., distinctly are. Such remarks should be omitted or very sparingly introduced in annual reports in future. How information of the sort can be best brought home to the classes who will benefit themselves and the State by applying it in practice is a question which must engage the Board's attention, but it is one which they will be in a better position to consider satisfactorily after the receipt of the orders of Government on the Proceedings relating to the question of agricultural education generally in this Presidency (*vide* Board's Proceedings, dated 13th December 1877, No. 5,223).

7. The Board consider carefully prepared statements of the particulars of the cultivation of certain areas with specified crops in the year to be very valuable, and that analyses of the results of such experiments are most fitting in the report of the year's work. Of course, the utmost attention should be paid to economical working in these experiments, not only on general considerations, but that the advantages of the system pursued and recommended may be as apparent as possible. It should not be lost sight of however in considering results that in the circumstances of a Government Farm the net returns in particular cases cannot be made the test of the advantages or disadvantages of a system advocated on scientific principles. Private agriculturists will undoubtedly be able to work on the same principles at a very much lower rate of expenditure than is obtainable, even with the most careful management on a Government Farm, and the difference they may reasonably look to saving must be credited to the profit side before the net returns that may be expected in private enterprise can be fairly calculated.

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(A true Copy and Extract.)

(Signed) J. STURROCK,
Acting Sub-Secretary.

No. 293. ORDER THEREON, 23rd July 1878, No. 1,148.

Miscellaneous.

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3. In the report on the season at Sydapet there is some instructive information as to the rainfall, which in any one month of the last seven years has but rarely approximated the average deduced from sixty years' observations at the Observatory, which is only about 3 miles distant.

4. In 1876 the rainfall seems to have been fairly sufficient until the second week of September, but its subsequent failure during the north-east monsoon was very marked and appears to have been altogether insufficient to admit of wet crops being raised. This being the chief cultivating season in the district in which the farm is situated its methods of cultivation adopted in the latter were subjected to a crucial test. In the case of the crops reported on, the result was highly gratifying, for deep cultivation and high manuring secured a fair outturn, and one that, with straw and grain at famine prices, was distinctly remunerative. How much this result was due to deep cultivation is demonstrated by the contrast worked out between the yield on the body of the fields and that on the head lands where the cultivation was shallower, though not more so than in the ordinary practice of the country.

Paragraph 39.

Paragraph 31.

5. The dry crops planted in October had a rainfall of about 5 inches on 12 or 14 days, while a crop sown in November had only 1·71 inches on 6 days, and another, put down in December, only ·16 inches on 3 days.

It is noteworthy that the yield of straw in the last two cases was on a par with that of the crops that received more rain, but that the grain outturn was small.

Deep cultivation is also reported to have secured very satisfactory growth in the case of the cotton and indigo crops, but the final results will not appear until next year's report.

6. In the matter of special crops it is noted that of five carob trees which had been planted eleven years, one has at last fruited, and that it is believed that it is the only female plant. Grafting the seedlings of this tree from known male or female plants is accordingly recommended.

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*Paragraph 151, Report for 1875-76.

8. In paragraphs 77 to 85 are recorded the results of some topdressing experiments made with saltpetre and bone charcoal on land sown with yellow cholum, but the dry season is said to have been unfavorable to the use of the farmer. The gain directly traceable to its use was not sufficient to repay the outlay, but it is hoped that the soil was permanently improved to the benefit of future crops. Bone charcoal is believed to be useless as a topdressing when used by itself, but further experience seems needed to place the matter beyond doubt.

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14. In connection with this point the Governor in Council learns with satisfaction that the Superintendent's correspondence on agricultural matters is increasing and that information is offered as well as sought. This fact and the numerous applications for admission to the School of Agriculture evidence a growing desire for an improved agriculture which must be a source of well founded attention to the Superintendent and his Assistants and is in a great measure the fruit of their zealous and intelligent efforts.

15. The Government consider that the papers contributed to this report by Messrs. Bo[illegible] and Shiffmayer reflect much credit on those officers, and Mr. Robertson himself has done well in calling attention to some neglected manural substances, though inference as to the high death-rate of farm stock drawn by him from the Customs House returns of exported hides and skins is based on incorrect premises. Large consignments of both skins and hides being regularly sent down by rail from both Bengal and Bombay to this Presidency to be cured and exported, as the product of Madras tanneries.

16. The Superintendent will submit his report for 1877-78 with the least possible delay and his annual report will in future be despatched to the Board of Revenue not later than the 30th June.

(True Extract.)

(Signed) C. G. MASTER,
Secretary to Government.

To the Board of Revenue.

Exd. W. J. Lewis.

Spare Copies.

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Secretary to Government.

To the Board of Revenue.

Exd. W. J. Lewis.

Spare Copies.

Govt. of (1878) Madras.

REVENUE.

To

THE BOARD OF REVENUE.

Dated July 23rd.

Recd. *Encl.*

G.O., 23rd July 1878, No. 1,148.

JULY.

Nos. 292-293.

Government Farm Report for 1876-77.—Reviewing the —; requesting speedy submission of report for 1877-78, and directing the Superintendent in future to submit his annual reports to the Board not later than the 30th June.

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3. In this report on the season at Saidapet there is some instructive information as to the rainfall, which on any one month of the last seven years has but rarely approximated the average deduced from sixty years observations at the observatory which is only about 3 miles distant. The difficulties that lie in the way of the cultivator owing to the uncertainty and variability of the seasons are thus forcibly demonstrated.

4. In 1876 the rainfall seems to have been fairly sufficient

There is not [illegible] deduction from the [illegible]

Some quite [illegible] sequence

Was [illegible] from the [illegible]

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In the Brd in Text the form is altered

para 39

para 31

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6. In the matter of special crops it is stated that of five Cambodia which had been planted eleven years one has at last fruited and that it is believed that it is the only female plant. Grafting the male

Notes worthy

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2 Para 151 report for 1874/75

of this tree from known male or female plants is accordingly recommended.

7. No mention is made of the buffalo grass which was favorably reported on last year. The results of further experience in its cultivation should be noted in next report. The Collector is not sanguine that the proposed experiment to induce Cambodians to alter its culture to allow of burning over will not be lost sight of.

8. In paras 77 to 85 are recorded the results of some experiments to produce saltpetre and made with saltpetre and bone charcoal on land some with yellow clay but the dry season is said to have been unfavorable to the use of the former. The gain directly traceable to its use was not sufficient to repay the outlay but it will no doubt be found beneficial in the case of future crops. Bone charcoal

This is an exemption which I cannot see

Charcoal is believed to be
useless as a top dressing
when used by itself, but
further experiments are
needed to place the matter
beyond doubt.

9. In last year's report
it was stated that indif-
ferent results had been
obtained in growing
groundnuts and it was
suggested that this was
due to a want of lime in
the soils of the farm. This
conjecture is now shown
to have been correct for a
crop of groundnuts manured
with lime gave an abun-
dant yield. The general
use of this manure is how-
ever not recommended
as its disinfecting qualities
render it of dangerous utility
in the hands of the ignorant
or shortsighted cultivator

10. The stock breeding
experiment has been delayed
from several causes but the
flock of sheep kept on the
farm has thriven well.
The loss was exceptionally
small

11 & 12

small and this is attributed
to the absence of the rank
grasses that spring up with
an abundant rainfall. The
quality of wool improved
but the yield per sheep was
less than found to be
fair for the weight of the sheep.

11. The Govt. note that the
Board have called for a
report in regard to the
financial statement drawn
by the Secy of State. In this
the farm accounts should
be kept distinct from those
of the school of Agriculture.

12. The Board further
remark that portions of the
Farm Report are devoted
to conveying advice on ques-
tions of fact which are not
directly illustrated by reference
to any particular operations
on the farm. These remarks
consider would find a more
appropriate place in a Jour-
nal of Agriculture and in
this view the Govt concur.
The preparation of such a
Journal &

Provincial Farm a work
that may well engage
the early attention of Sir
Robertson and his assistants
and much of the requisite
matter is to be found in the
interesting papers which
accompany the present
report.

13. The Provincial Farm
Report should deal only
with its working but
should show clearly and
in sufficient detail what
was done and left undone -
the total extent - the area
under wet and dry cult-
ivation - the extent of
grazing lands &c &c, and
the financial results. From
the present report the Govt
are wholly unable to gather
how far lands were left
uncultivated or crops lost,
or how the stock was main-
tained. The record of the
experiments made in cult-
ivation & with special
crops is woefully interesting
and shreds of course be
continued

11/8/95

as well as the extent to which
Prof Robertson's views have been
carried out & with what success
further progress & additions
should be made in the future
to render the Farm more
useful to the Province.

Yours very truly

Settled in Council 19.7.78.

but that the plan
on which the whole operat-
ions are being conducted,
and how far it was succ-
essful or the reverse,
should also be shown.

The Govt do not expect
the farm to be directly
profitable but they wish
to make it really useful
and believe that this end
may best be secured by
adopting its entire prac-
tice to public criticism.

14. In connection with
this point the Governor in
Council learns with satis-
faction that the Supts
correspondence on Agricult-
ural matters is increasing
and that information is
offered as well as obtained
This fact and the numerous
applications for admission
to the school of Agricult-
ure, evidence a growing
desire for an improved
Agriculture

Agriculture which must
be a source of well
founded anticipation to the
Supt and his Assistants &c
is in a great measure
the fruit of their zealous and
intelligent efforts.

15. The Govt consider
that the papers contributed
to this Report by Messrs
Benson and Schiffmayer
reflect much credit on
those officers and the
Collection himself clear
down will in calling attention
to our neglected
mineral substances,
though the high death
rate of Farm Stock
enforced by him from
the customs-house return
of refuse hides and
skins & hoofs in most
parts, [illegible]
has recently been brought
to the notice of Govt through
large consignments of flesh
skins and hides [illegible]
regularly

regularly and down by
rail from both Bengal
and Bombay to this Presi-
dency to be cured and
exported, as the product
of Madras tanneries com-
manded a higher price in
the English market.

L.C.

W 88/96

To be printed

See report of Committee in
Military Dp. 1st May 1878 No 2132

Settlement
Council
1877.

114 Forks Boundary Reserves Sub Report

18/6