Report of the Experimental work of the coimbatore Agricultural Station

1912-13

Department of Agriculture, Madras.

REPORT

OF THE

EXPERIMENTAL WORK

OF THE

COIMBATORE AGRICULTURAL STATION

FOR

1912-13.

BY

H. CECIL WOOD,

Principal of the College of Agriculture and Superintendent of the Central Farm, Coimbatore.

MADRAS:

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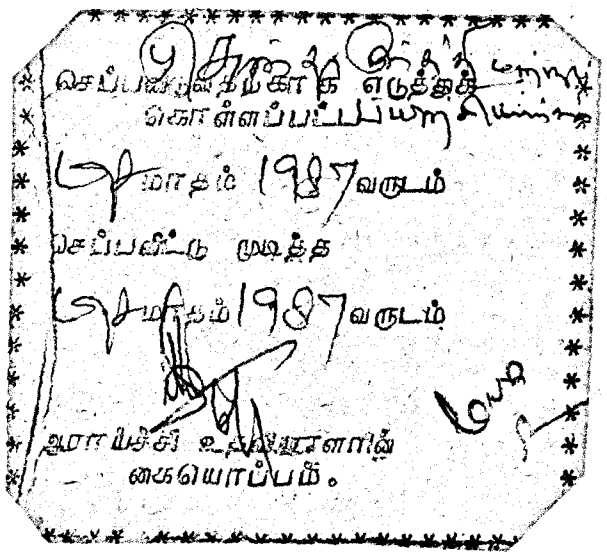

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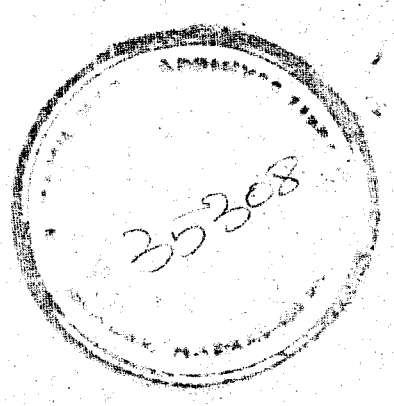

REPORT OF THE EXPERIMENTAL WORK OF THE COIMBATORE AGRICULTURAL STATION, 1912-13.

The farm is situated in the village of Thetungapalayam, two miles to the north-west of the town of Coimbatore, and consists of two blocks. The major portion comprises about 400 acres, of which nearly half is under dry cultivation, while 80 acres are protected by wells: the balance of 120 acres being maidan, compounds, roads and other uncultivated land. Forty-five acres lie at some little distance from this, under a tank, and are devoted mainly to the cultivation of wet paddy.

2. The soils are mostly of two types—red and black, both fairly fertile, and both underlain at small, though varying distance, by beds of kankar (nodular limestones), which ensure good drainage. Some of the land on the west is distinctly alkaline. Typical analyses made by the Agricultural Chemist show the following constituents.

TABLE I.

Chemical analyses.

Constituents.	No. 20, garden land.	Average of Nos. 10 and 11, dry red lands.	No. 13, black soil.
Sand and insoluble	79·040	86·78	78·50
Fe_2O_3	4·730	2·25	3·06
Al_2O_3	6·080	4·10	7·00
CaO	1·500	1·52	3·67
MgO	·920	·49	1·46
K_2O	·530	·21	·36
Na_2O	·120	·18	·18
CO_2	·540	·36	·05
P_2O_5	·115	·028	Trace.
SO_3	·030	·011	1·30
Loss on ignition	5·795	3·381	4·24
Total ...	100·000	100·000	100·00
Nitrogen	·0567	0·037	·034
K_2O available	·018	·003	·003
P_2O_5 available	·036	·011	Trace.

TABLE II.

Mechanical analyses.

Constituents.	No. 20.	No. 10.	No. 13.
Fine gravel	6·3	18·3	9·5
Coarse sand	17·4	41·1	25·0
Fine sand	19·1	15·1	15·1
Silt	6·5	2·1	6·4
Fine silt	21·1	9·8	28·1
Clay	25·7	12·4	12·0
Moisture, etc.	3·9	1·2	2·3

The extreme difference between the garden soil and the dry red soil is noticeable—the soils are not far from each other and are exactly the same in type, but one is highly formed under irrigation (see paragraph 5), while the other is single crop land unprotected from drought in any way. The black soil is extremely poor in available potash and phosphoric acid. From the physical point of view, this soil is somewhat different from the black soil of the Coded Districts and contains more sand: it certainly behaves differently from the Hagari soil in cultivation. The red soils are noticeable for the large amount of clay and coarse sand they contain, intermediate particles being absent. This makes them difficult to cultivate when wet, for any puddling results in the formation of what is practically a brick—the soils, as a matter of fact, do bake very hard in the hot weather and are very sticky when wet.

3. *Season.*—Meteorological records are kept by the lecturer in Physics, and are complete for the current year for the first time (see Appendix I). An anemometer has recently been received and will be erected. The wind is extremely violent here and undoubtedly affects the cropping, and some interesting figures should be obtained.

The season opens with the south-west monsoon, which sets in about the beginning of June. It causes a considerable drop in temperature, but brings little rain—the slight drizzle that is received is neutralised by the high wind and sowings cannot in general be done until the wind begins to slacken about the middle of August, when the main crops are sown. The north-east or retreating monsoon sets in about the beginning of October, and it is then that the greater portion of the annual rainfall, never very heavy, is received. January, February, March are dry months, but thunderstorms may be expected in April and May which bring rains and facilitate tillage operations generally. The temperature even in the hot weather rarely rises above 100° and during the early part of the south-west monsoon it is distinctly cold. There is, however, no real cold weather, the temperature rarely falling below 60°.

4. *Systems of cultivation.*—There are three main systems of cultivation practised on the farm, and they are carried out on what are known in this Presidency as 'dry,' 'garden' and 'wet' lands. The first is the cultivation of cholam (sorghum), cumbu (*Pennisetum*), Bengal gram (*Cicer arietinum*) and cotton with the help of the rainfall only, and without any assistance from irrigation. As the rainfall is only about 20 inches, such cultivation is somewhat precarious, though in a good season, very fair crops are sometimes obtained. The sorghum crop may produce upwards of 700 lbs. of grain and 3,000 lbs. dry fodder, but the average is of course much less than this. The assessment on such lands, of which both the red and black soils are represented on the farm, is about Rs. 2 per acre.

5. The 'Garden' lands are those that are irrigable by wells. This involves a complete change in the system of cultivation employed. Two or even three crops in the year are raised with the help of heavy dressings of manure, and the total value of crops raised off an acre in a single year is anything from Rs. 100 to Rs. 250. The Coimbatore garden land farmer is an extremely good specimen of his kind. He generally lives on his land, and has a small steading near his well, where he stores his fodder and carefully looks after the cattle on which he depends for lifting the all important water for his crops. This is

generally done by means of a mhote or leather bucket with a tail holding about 50 gallons. The bullocks lift this by walking down a long steep ramp, backing slowly up when the bucket is discharged: the wells are often 40 feet deep. The crops grown are ragi (*Eleusine Coracana*), wheat (*Triticum sativum*), sorghum, cumbu (*Pennisetum typhoideum*), tenai (*Setaria italica*), castor and cotton, the last as a dry crop to rest the land. The assessment is the same as on the dry lands; permanent improvements not being assessed.

6. 'Wet' lands are those which are commanded by some source of irrigation, from which a copious flow of water for a comparatively short season is available, and are devoted to growing 'wet' paddy under swamp conditions. The source for the farm wet lands is a tank fed by a channel taken off from a perennial hill stream, the Noyil, which takes its rise in the Bolampatti valley of the Velliyangiri hills. Water is available from July onwards, and cultivation commences with the flooding of the fields in that month. The lands are then ploughed in puddle, and seedlings which have been raised in a nursery sown some thirty-five days previously, are transplanted in the resulting mud. The fields are generally manured with large quantitites of green leaves brought from the jungles near, or collected from waste lands, which are trampled by coolies into the soft mud and quickly decompose. The fields are kept continuously flooded, the water being changed about once in ten days, until about a fortnight before harvest, which takes place according to the variety in December or January. Where wet cultivation can be supplemented by wells, exceedingly profitable gardens of betel vine, sugarcane and cocoanut palms can be raised. The first two are represented on the farm, and there are upwards of 350 cocoanuts scattered about on bunds and along water channels, though there are none in the form of plantations, which are mainly confined to the alluvial tracts along the banks of the Noyil itself. Though wet cultivation, especially in the delta districts under a safe system of irrigation, is considered the most lucrative form of cultivation, the somewhat uncertain supply here tends to diminish the profits, especially when compared to the garden cultivation above referred to, yet there is no doubt that in good years very large profits are secured. The assessment which includes the use of Government water varies from Rs. 4 to Rs. 8.

PART I.

7. The season this year has been a good one, though it is unlikely that a farmer can be expected not to grumble. The first sowings in May failed, as the rains were light and discontinuous, but all sowings were done in good order in June. After that a severe break occurred, and no rain in any quantity was received until towards the middle of September, when cholam sowings, particularly those on black soils were completed. Good rains were received in October for the cotton sowings, but November provided the greatest surprise in a total fall of 12·5 inches the greater portion of which fell in a week, between the 14th and the 21st. Since then, the weather has been dry.

The total rains received were above the average, and though they might have been distributed better, the underground water level has been raised and the wells are higher than they have been for a long time.

TABLE III.

Statement of rainfall.

Months.		1908.		1909.		1910.		1911.		1912.	
January	1–15	0·00		2·49		0·00		0·00		0·00	
	16–31	0·46		0·00		0·00		0·00		0·00	
February ...	1–15	0·00	1·84	0·00	2·49	0·15	0·44	0·07	0·17	0·00	0·00
	16–28	0·57		0·99		0·29		0·00		0·00	
March	1–15	0·00		0·00		0·00		0·08		0·00	
	16–31	0·61		0·00		0·00		0·02		0·00	
April	1–15	0·00	1·78	2·50	7·87	0·33	2·06	0·76	5·82	0·66	3·13
	16–30	1·03		0·45		1·11		1·73		0·00	
May	1–15	0·63		4·37		0·11		0·18		1·55	
	16–31	0·06		0·55		0·21		3·15		0·22	
June	1–15	0·24		1·28		0·10		2·35		1·15	
	16–30	0·07		0·15		1·90		2·50		0·62	
July	1–15	0·02		0·72		0·82		0·22		0·39	
	16–31	0·60	2·34	0·57	6·11	1·71	10·40	3·06	12·85	2·41	8·27
August	1–15	0·36		0·15		1·32		0·00		0·04	
	16–31	0·10		2·26		5·62		0·02		0·30	
September ...	1–15	1·03		0·86		0·09		0·52		1·05	
	16–30	0·02		0·12		0·84		5·98		1·42	
October	1–15	0·84		3·76		1·19		1·32		5·82	
	16–31	9·09		2·49		8·09		4·61		1·03	
November ...	1–15	0·34	11·17	1·10	8·87	3·63	14·36	0·80	10·33	3·06	20·28
	16–30	0·00		0·44		1·45		2·57		8·84	
December... ...	1–15	0·00		0·58		0·00		2·18		0·03	
	16–31	0·00		0·00		0·00		0·05		0·00	
Total ...		15·93		24·84		27·26		29·77		31·63	

8. *Estate improvements.*—An improvement has been effected during the year by the acquisition of a piece of land to the south-east of the college which formed a re-entrant angle to within a short distance of the college itself. Part of this land has been used immediately as a site for additional quarters. The general work of draining, fencing, straightening boundaries and other estate improvement was proceeded with whenever possible. The numerous trees, which have been planted about the estate during the last five years, are beginning to make some show of greenery; the Lawley Road avenue especially promises to be a most handsome approach to the estate.

The increasing herd necessitated further extension of the cowshed and it has now been extended along three sides of a square: rooms for

preparing food and for a store room have also been included. Further sheds for dry cows and calves, of a rougher and cheaper design are now being erected. Considerable use has been made of rammed gravel for the construction of walls in the yard, notably one round the threshing floor and the other round the farm well. The fitting of a new pump to this latter, a 3" *Rees Roturbo* pump, was made the occasion to tidy up this well, and the irregular pit at the bottom of which the engine and well worked has now been sloped and trimmed. The material excavated has been found most useful for road metal and other purposes. The old cistern used temporarily for the college supply, has now been transferred to this well, and it is hoped to instal a pipe supply to all the Farm buildings and the Veterinary hospital, where it is especially needed.

9. *Implements.*—The question of improving dry and garden land cultivation by the adoption of iron ploughs of European pattern has, as *forecasted* in last year's report, been taken up. Experiments carried out by an expert member of the firm of Messrs. Ransomes, Sims and Jefferies, resulted in the introduction of three ploughs which are now in use. First the *Monsoon plough*, which for iron-work only, costs Rs. 12. This has not proved as satisfactory as the double still plough which was brought for trial here: it possesses a single stilt like the country plough, but rather an awkward handle, which could of course be easily modified and, to allow of the ploughman using his left hand, as is customary, the plough is made to turn a furrow to the right. It is a useful plough for garden land, but I fancy a more suitable implement will be found among some of the other ploughs which are now on trial, the Kolar Mission plough, the Rajah, the Punjab or the Neria ploughs. Like many of the ploughs made by this firm the point of the share is a chisel edge, which is renewable at a cost of only three annas. The other type of plough is known as the S.B.P., or *steel bar plough*, owing to the fact that the point of the share is really an iron bar running through the body of the plough, which can be pushed up as it becomes worn. The advantages of this are obvious, and the plough is found most useful in cases where the land is too hard for the lighter-made Monsoon plough. For still harder lands, a special form of this plough has recently been sent for trial, but the soils here dry irregularly, and come up in lumps, often of a very large size, which seriously interfere with the steady working of the plough: in a gravelly soil, it would work better. Messrs. Octavius Steel, the Agents in Calcutta of Messrs. Ransomes, Sims and Jefferies have been most obliging in sending ploughs for trial and they have recently sent a double furrow disc plough for trial, which has proved itself capable of tackling black cotton soil most successfully. With a pull of 8—10 cwt. which necessitates four pairs of animals, it will cover 22" of ground and leave it in rather a better state than the Steel Eagle or Massey's cotton soil plough will do. The general results of the trials made have been to show that the thorough cultivation of dry-lands can be easily undertaken with iron ploughs drawn by two pairs of cattle, and this year a large proportion of the dry land of the farm has been broken up in this way at a cost of about Rs. 5 per acre inclusive of all charges. The ploughs used have been the *Steel Eagle* plough, and two Gallows ploughs, one English and one German make. The work being facilitated this year by the unusually heavy rains received in the latter part of November. The problem with garden lands is not so simple. The ploughs mentioned above turn a

furrow 8" or 9" deep, and though an occasional ploughing of this sort is no doubt beneficial, it is impossible in ordinary routine, as it requires too much time to allow the land to weather properly after such treatment, while the land is left so open that the cost of irrigation comes very heavy. What is wanted for normal use on such lands, is a light inverting plough, going only four inches deep and capable of working in fairly moist soils. If the soil is allowed to dry, the upper layer crumbles, while the layer below this, is apt to turn up in lumps and prevent good work. Unfortunately garden soils tend to be sticky and clog the plough seriously, if ploughed in too moist a condition. It is possible that some form of light riding plough turning two or more furrows will be found to do what is wanted. Ridging is successfully done with Ransome's one way plough E.T. 31 with ridging parts. Wet land cultivation has not been touched at all, except that the land intended for cane was broken up with the steel bar plough. The small size of the plots and the bunds separating them, prevented the work being properly done.

Experience has shown that considerable care is necessary at first in supervising the men using the ploughs, but now that they are getting used to them, they can be trusted to work more or less by themselves. The main difficulties lay in getting them to steer properly, and to prevent them ploughing with the share pointing downwards into the ground with a very heavy pressure on the wheel.

It is hoped shortly to erect a small implement museum for the display of properly labelled or priced implements which the department can recommend, for general departmental use and also for the instruction of the students, who will be then able to note and compare the different types of implements, and the different purposes for which they are intended.

During the year a small disintegrator was erected. This was originally purchased at the suggestion of a former Director, Mr. Coachman, who considered that by demonstrating the manufacture of bonemeal by a small plant such as could be used by any one owning an oil-engine for pumping or other purposes, the Department would be assisting in diminishing the export of bones which at present occurs on such a large scale. Considerable delay was experienced in getting the shed and other fittings finished, and even now there are still some alterations to be made, but the machine, a little Christy and Norris size 00 at Rs. 340 seems to work easily. It is being tested with other materials, and the complete information which is being accumulated will be published in a leaflet.

The sugarcane mill sent up for demonstration by Messrs. Burn & Co., has recently been sold, and the firm has been asked to send another in its place.

The engine records are now fairly complete, and show that even with a farm of this sort, there is only a limited scope for the introduction of power machinery for agricultural work. The engine runs a chaff-cutter, threshing machine, cotton-gin, oil-crushing plant, cotton-seed-crusher, cake breaker, and latterly a disintegrator. The cake breaker and the oil-crushing plant are not used. Of the rest of the work, ginning is undoubtedly the most profitable, and it is this alone which has enabled a profit to be shown on the year's work.

Chaff cutting by hand cannot of course be compared to the work turned out by the machine, but it is impossible to estimate the value of chaffing straw from a feeding point of view. Threshing can be done more cheaply by cattle or by hand, partly because we have not enough work to make it worthwhile investing in a machine which would perform the whole work. The thresher is however invaluable for experimental work, which it would be impossible to get done without it.

The difficulty of course lies in arranging the work so that as many machines as possible shall be running together, but this is not always possible. The cost of running the engine, with attendance, and depreciation comes to Rs. 500 per annum. The work turned out was valued the year before last at Rs. 379 and this year, owing partly to the increase in ginning Cambodia, at Rs. 620.

A double Chatterton pump worked by a small 3½ horse-power engine was seen at work at the Tiruppur show, and was subsequently hired for trial, and because cattle were short. The machine was found to be equivalent roughly to the work of one and a half mhotes, and at this rate, was not considered economical. It has accordingly been recently dismounted, and is being returned to the makers Messrs. Massey & Co.

Some tentative trials were made with gelignite, a small quantity of which was kindly supplied by Messrs. Best & Co., the agents for Nobels Explosives. Efforts have been confined at present to trying to blow up trees, but at this time of year, the soil is too hard and too full of cracks. The hardness makes it difficult to bore a clean hole, and the cracks dissipate the energy of the explosive too soon. The trees themselves are usually too hard to bore with an auger into, except in the case of cocoanuts, when a trial was more successful. It is hoped to try the effect of torpedoing one or two of the wells with a view to increase their water-supply.

PART II.

10. *Paddy.*—The area under the crop this year was slightly greater than last year, and amounted to 39·42 acres. The season was favourable, and no difficulty about irrigation was experienced. The drought in August and September was somewhat trying, and the heavy rains of November caused a real loss, especially to the earlier maturing varieties which were then nearly ripe, and caused an increase in the proportion of chaff to grain. The average yield for the whole area including all the experiments, was 2,665 lbs. per acre; an improvement of about 165 lbs. on last year's crop. The experiments were continued on the lines mentioned in last year's report, and comprise the planting experiments in Block A, the manurials in block C and the patimanna substitute plots in E.

11. The first series consist of two rows of plots laid out on either side of an irrigation channel running from north to south; in each series, a different variety is planted, the varieties changing place each year. At the same time the plots are moved one down, so that each experimental planting will in turn have occupied each plot. This precaution is necessary because of the gradual deterioration of the soil, from the tank southwards, which is due probably to the silt carried by the water, the plots near the tank getting more than those at a

distance. This effect is clearly shown by contrasting plot 2 with plot 18. Both are unmanured and both are planted in exactly the same way: from plot 2 the first to receive tank water, was harvested 2,468 lbs. grain and 3,616 lbs. straw: the yield of No. 18, the last to get tank water was 1,834 lbs. grain and 3,210 lbs. straw.

The general treatment of these plots was to manure them with wild indigo, and for this purpose the seed was sown and the land flooded in March and April. The wild indigo failed to germinate, and the weeds got the benefit of the irrigation so that considerable difficulty occurred at the time of puddling. A small quantity of green leaf, Daincha, etc., from Block B and some purchased Erukam (*Calotropis*) leaf was applied to make up to 4,000 lbs. per acre and the plots were planted between the 29th July and 1st August. The full results are given below:—

TABLE IV.

Spacing experiments—1912–13.

Variety—Sinna Samba.

Plot number.	Area in cents.	Treatment	Yield per acre.	
			Grain.	Straw.
			LBS.	LBS.
2 (a, b) ...	9·4	Locals, no manure	2,468	3,616
4 (a, b) ...	15·5	Singles 9″	2,709	4,335
6 (a, b) ...	9·7	Doubles 9″	2,773	4,783
8 (a, b) ...	11·8	Trebles 9″	2,813	4,542
10 (a, b) ...	13·0	Do. 12″	2,338	3,515
12 (a, b) ...	11·3	Locals	2,480	4,070
14 (a, b) ...	17·0	Singles 4″	2,182	4,400
16 (a, b) ...	20·0	Do. 6″	2,200	3,540
18 (a, b) ...	18·1	Locals, unmanured	1,834	3,210

Variety—Sadai Samba.

Plot number.	Area in cents.	Experiment.	Grain per acre.	
			Grain.	Straw.
			LBS.	LBS.
1 (a, b) ...	8·7	Rows 6″ × 9″	2,762	3,586
3 (a, b) ...	13·3	Singles 4″	2,002	3,363
5 (a, b) ...	14·8	Locals	3,281	3,973
7 (a, b) ...	16·0	Do.	2,000	4,175
9 (a, b, c) ...	15·7	Singles 6″	3,150	3,592
11 (a, b, c) ...	17·2	Do. 9″	2,593	4,010
13 (a, b, c) ...	21·2	Doubles 6″	3,434	3,792
15 (a, b, c) ...	19·3	Trebles 9″	2,677	3,250
17 (a, b, c) ...	22·1	Do. 12″	2,445	2,751
19 (a, b, c) ...	25·4	Locals	2,323	3,212

The 'Locals' plots are those planted by the farm ryot with his own seedlings, by his own coolies, and in his own way. They serve to estimate the advantages to be gained by the adoption of the practice of planting singly, and they serve also as check plots to gauge the inequalities of the land. In this respect, the large difference noted between plots 5 and 7 is somewhat disquieting. On the whole the results are extremely regular, and show no such striking difference as could be noted in a single experiment. Taking first Sinna Samba, "Trebles 9 inches" (by which is meant a plot which is planted with clumps of three seedlings, each clump being 9 inches from the next clump) as last year, is a little better than doubles 9 inches, while this in its turn beats singles 9 inches. The yield of trebles 12 inches on the other hand is lower. Of the singles, the 9 inches planting is the best, but is benefited by its position; 4 inches is a little better than 6 inches.

In the case of Sadai Samba, a shorter term paddy of somewhat coarser nature, very similar differences can be made out. Doubles 9 inches in this case however, beats both singles 9 inches and trebles 9 inches. Trebles 12 inches is the last plot in the series and is accordingly low. Singles 6 inches is the best of the 'singles' plots.

The counts formerly made and the determinations of the weights of the ear-heads have been given up. Counts carefully made on small areas were found to be insufficiently accurate for any forecasting, while accuracy in spacing was obtained by stretching strings across the plots. Planting was most carefully done, and the general arrangement of the plots was most creditable to the Manager and his Assistant.

12. *Manurial experiments.*—These are laid out in block C and have mostly been manured similarly for some years, though a change was made this year, by the substitution of a poudrette plot instead of calcium cyanamide. The figures are given for the complete series.

TABLE V.

Plot No.	Treatment.		1908–09.		1909–10.		1910–11.		1911–12.		1912–13.		1912–13.	1912–13 unmanured except by washings from manured plots.	
			Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Net Profit	Grain.	Straw.
		LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	RS.	LBS.	LBS.
1. a and b ...	Calotropis or Yerukkam ...	4,000	2,369	4,955	3,537	3,583	3,756	4,269	...	...	...	...	...	...	...
2. a and b ...	Wild Indigo	4,000	2,500	2,367	3,520	3,596	3,399	4,110	...	...	...	...	...	...	...
3. a, b and c.	White castor	400	2,508	3,564	3,242	3,077	3,386	5,239	2,883	3,155	2,550	4,428	120	2,220	4,579
4. a, b and c.	Black castor	500	2,436	2,814	3,115	3,418	3,619	1,647	2,647	3,764	3,310	7,310	158	2,109	3,186
5. a, b and c.	Bonemeal	500	2,584	4,028	2,740	2,761	3,406	5,973	2,437	2,718	3,081	7,888	145	2,141	5,304
6. a, b and c.	Bonemeal + * Potassium Sulphate ...		...	...	2,613	2,557	2,963	3,470	2,346	2,952	2,797	5,771	115	2,044	3,886
7. a, b and c.	Fish Manure †		...	...	3,903	4,121	3,379	5,909	2,469	2,848	2,803	5,364	121	2,072	4,978
8. a, b and c.	Fish manure 5 cwt. + ½ cwt. Potassium Sulphate.		...	...	...	...	3,100	4,127	2,447	3,149	3,000	5,858	128	2,676	4,863
9. a, b and c.	4,000 lbs. green leaf + 350 lbs. Calcium Nitrate in 1910–11.		...	...	...	...	2,821	1,565	...	...	...	...	...	...	...
	Calcium Cyanamide 3 cwt. + leaf 4,000 lbs. in 1911–12.		...	...	...	...	...	...	2,420	2,710	...	...	...	...	...
	Poudrette 2 tons + green leaf 4,000 lbs. in 1912–13.		...	...	...	...	...	...	...	...	2,984	7,797	135	2,666	6,550

* Potassium Sulphate 1 cwt. in 1909–10 and ½ cwt. in other years.   † Fish manure 540 lbs. in 1909–10 and 5 cwt. in other years.

It is clear from a consideration of the above figures that certain definite conclusions can be drawn. The first is the undoubted superiority of black castor cake, *i.e.*, cake in which a good deal of the husk is left, for manuring the paddy crop: it tops the list in actual yield and in profit. As compared with the white cake it is cheap; the husk in it perhaps from its physical characters helps to keep the soil open. Its use may be definitely recommended in future. An examination of the figures for the last three years, shows that most of the plots have retained their relative position, and this proves that the plots have reached a position of equilibrium. Unfortunately, there is the same unevenness in the land that was mentioned before, the land becomes steadily poorer as the distance from the tank increases, with a result that the plots at the top end are naturally superior to those lower down. The variation may be taken to be regular and the intercalation of check plots should enable this variation to be gauged.

The plots in the last column show little variation: these are watered through the respective manured plots, and drain directly into another channel and thus they serve to indicate the losses which may be sustained from the washing out of the manures used: it may be surmised that these are little in any case, and it can be stated certainly that there is little difference in the way in which the different manures suffer in this respect.

A word may be said about the use of poudrette. This is made on the estate, and has been found a most satisfactory method of disposing of the estate sewage. Ashes are generally available, as all rubbish, paper and so on collected on the estate is regularly burnt in an incinerator. It has been given a trial for sugarcane this year, and has proved most suitable: it is also being used for fodder crops under irrigation. The use of this manure, in the shape of poudrette or other forms, is rapidly spreading in the neighbourhood of some of the larger towns and very high prices are obtained for it.

13. *Patimannu substitute plots.*—These rather curiously designated plots really form a simple manurial experiment, and owe their name to the fact that it was the use of "Patimannu" or village earth as a manure for paddy in the Kistna district, which first caused this series of plots to be laid down. The plots are arranged in duplicate and have been in existence for four years. By making liberal deductions for the unevenness of the ground, which as in all the farm land varies directly with its proximity to the channel supplying water, certain deductions may reasonably be drawn. The full yields are given below.

TABLE VI.

Patimanna substitute plots.

Plot No.	Manures and quantities.	Supplying.	1909–10.		1910–11.		1911–12.		1912–13.		1912–13.	
											Duplicates separately.	
			Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.
			lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
P 1 b	Sunnhemp	N	2,740	2,311	2,814	2,661	3,046	5,387	3,942	4,471	4,154	4,934
P 1 c											3,732	3,958
F 2 d	Sunnhemp + 1 cwt. Potassium sulphate.	N + K ...	2,703	2,271	3,294	3,225	2,736	4,208	3,892	4,188	3,084	3,710
F 3 b											3,700	4,666
F 2 a	Sunnhemp + 1 cwt. Potassium Sulphate + 1 cwt. Super Phosphate ...	N + K + P ...	2,807	2,782	3,601	3,805	3,580	6,752	4,340	6,038	4,667	7,333
F 2 c											4,014	4,743
F 2 b	Sunnhemp + 2 cwt. Potassium Sulphate + 1 cwt. Super Phosphate.	N + 2K + P ...	3,180	2,220	3,603	4,000	3,267	5,545	4,430	6,198	4,056	5,670
F 3 a											4,804	6,826
F 1 a	Sunnhemp + 1 cwt. Potassium Sulphate + 2 cwt. Super Phosphate.	N + K + 2P ...	3,608	2,666	3,382	4,870	3,634	6,569	4,440	5,294	4,892	7,185
F 1 d											3,988	3,454
F 3 c											3,463	4,236
F 3 d	Sunnhemp + 1 cwt. Super Phosphate ...	N + P ...	3,708	1,703	3,783	4,042	2,745	3,197	3,517	4,187	3,572	4,136
E 3 b	1 cwt. Potassium Sulphate	K	2,726	2,837	3,668	3,521	2,521	3,004	3,401	3,624	3,401	3,624
F 4 b	1 cwt. Super Phosphate	P	2,370	1,373	4,000	3,152	2,424	2,948	3,500	3,570	3,500	3,576
E 3 a											4,084	5,126
F 4 a	No manure	.....	2,675	2,709	3,302	3,184	2,422	3,762	2,802	4,923	3,520	4,720

The no manure plots are both situated next the supply channel and are accordingly favoured by their position, and give yields which are too high when compared with the manured plots; the plots moreover show no signs of exhaustion, the last year's yield being the best of the four.

For the effect of Nitrogen we may compare plots 1 b. and 1 c. with these unmanured plots. 1 b. is better than either of the plots receiving no manure, but 1 c. is slightly less than 3 a. owing no doubt to its position, though better than 4a. The average of the four years'-cropping is also in favour of the plots receiving nitrogen. This constituent is supplied in the form of a crop of green manure, sann hemp (*Crotolaria juncea*) which is ploughed in before the crop is planted. The only plots which do not get this dressing which of course not only provides nitrogen, but has also an effect on the soil texture, are the unmanured plots mentioned above and the two plots receiving potash only and phosphoric acid only. On the four years' average, the nitrogen plots are better than the potash plots and poorer than the phosphoric acid plots. This difference between the other two manurial constituents, is typical of their behaviour right through the series. The addition of potash to nitrogen (plots 2 d. and 3 b. compared with 1 b. and 1 c.) has resulted in a depression in the yield. The addition of an extra dose of potash to a complete manure (plots 2 b., 3 a. compared with 2 a. and 2 c.) has, on the average of the four years, similarly reduced the yield.

The effect of phosphoric acid is on the other hand in the opposite direction, and is strikingly marked. Alone, it is a little better than nitrogen only (compare 4 b. with 1 b. and 1 c.), but is possibly somewhat favoured by its position: as it is not duplicated it is not possible to make a definite statement on this point. *Combined* with nitrogen however its effect is marked; in spite of their poor position plots 3 c. and 3 d. are superior on the average of four years to the plots getting nitrogen alone. A similar effect is shown by the addition of phosphoric acid to the plot getting nitrogen and potash: (Plots 2 a., 2 c. compared with 2 d. and 3 b.), and also by the addition of an extra dose of phosphoric acid to the plot receiving a complete manure (plots 1 a. and 1 d. compared with 2 a. and 2 c.), in every case the use of phosphoric acid has given an increase.

The results of the experiments, which will be continued, are thus, in spite of the inequality of the land, capable of clear and definite interpretation, and afford positive proof of the need for supplying phosphoric acid to this crop on this land. The necessity for potash is very much less, and in fact it can hardly be said to be needed at all; a small quantity may perhaps be added with advantage to a manure consisting of a bulky organic substance supplying nitrogen, fortified with a liberal allowance of phosphoric acid. It is interesting to note that these results are borne out by experiments conducted elsewhere, and it is fortunate that this is so, since phosphoric acid is cheaper than potash. There are of course many forms in which this substance can be supplied. Bone meal is under trial in the other manurial experiments at this station. Superphosphate is now made in the country, but is expensive. It is open to question whether with the extraordinary bacterial activity which exists in a paddy field at the time of puddling, it is necessary to use a soluble manure. There are in Madras, considerable deposits of phosphoric nodules, which are easily worked, and

which can be readily ground into a fine powder, of which use might be made. It is probably this substance which is sold by a local firm under the name of flour phosphate, at Rs. 45 per ton with a guaranteed analysis of 27 per cent. phosphoric acid rendered soluble. A trial which was given to this manure this year seems to bear out the theoretical estimate of its value. As a result of duplicate plots, an increase of 264 lbs. of paddy and 500 lbs. straw was obtained at a profit of about Rs. 10 per acre: the dressing was at the rate of 3 cwt. per acre, so a certain residual effect may be looked for.

14. *Green manuring.*—Besides the definite experiments noted above, the farm cultivation exemplifies the various improvements which the department have been from time to time advocating, such as the reduction of the seed rate by the adoption of thinner planting, and the economy effected by the use of green manure grown on the land instead of green leaf brought from elsewhere. Of the first point there is not the slightest doubt. The average seed rate for the whole of the farm lands was 17 lbs. per acre, or about 6 Madras measures, as against the 30 or 40 Madras measures which was formerly used, and this without the slightest reduction of the crop, which is indeed generally increased by the adoption of this system. More care must be expended in lifting the seedlings, to avoid breaking the rootlets, but once the women are accustomed to plant singly, they work faster than when planting bunches, so that there is really no loss.

15. The question of green manuring is not so simple; it is complicated by two other issues, the effect of watering the land for the purpose of germinating the green manure seed, and the effect of the time at which planting is done. The relative importance of these three factors is, and must for many years, remain a matter of judgment. In land, poor in organic matter, the wonderful effect of a heavy dressing of sunnhemp is astonishing, and may lead, unless considered along with other results, to exaggerated opinions about the value of this improvement. In the large deltaic tracts, where leaf is scarce, and at times impossible to obtain, green manuring occasionally must be resorted to, even at the risk of failure from other causes, as the land will show the effect of this soiling for many years. On the other hand, on the farm lands, it has been the practice to apply up to 4,000 lbs. of leaf every year, with the result that the effect of the leaf is likely to be much less striking. The saving of cost in growing leaf will of course vary with the district; here, we are particularly fortunate, and if we take steps to obtain the leaf early, we can get it practically as cheap as it can be grown. It is not always easy, moreover, to puddle in a very heavy crop of green manure with the inefficient ploughs and cattle generally available. The risk of injury to the land by hot weather irrigation and subsequent drying, is not only in the great encouragement it gives to the weeds, directly by irrigation and indirectly by stopping grazing, but is also due to other causes which are not so clear, and for which an explanation is not so easy to find. It is partly biological, and partly due to the alteration in the texture of the soil, which follows a summer flooding, and *subsequent drying*; this alteration tending to a blocking of the pore spaces and consequent loss of percolation. The effect is more marked in some lands than in others: here, we have not experienced any very serious losses, though the poor yield of the plots in block A

may perhaps be ascribed to the fact that the land was flooded for the growth of wild indigo, and subsequently allowed to dry. The failure of the Farm plots to beat the maistry's plots may also be due to a similar fact: they were flooded to start the sunn-hemp, which failed. In these plots the maistry is left entirely to himself: he grows his own seed bed, and brings his own coolies to plant: on plots alongside, the methods recommended by the farm are compared. Last year a liberal scheme of manuring was adopted, and a bigger crop than the maistry's was grown, though at a slightly less profit, owing to the higher cost of the manure. The residual effect of this manure has apparently been masked by the effect of the hot weather ploughing, since the yields this year are actually less than those obtained by the maistry. There is a saving in the expense for manure this year, because only half the standard dressing was applied to the Farm plots. The yields for the two years are given below:—

TABLE VII.

Farm and Maistry's plots.

Area.	Plots.	Yield per acre, 1911–12.		Yield per acre, 1912–13.		Total profit per acre.
		Grain.	Straw.	Grain.	Straw.	
ACRES.		LBS.	LBS.	LBS.	LBS.	RS.
·32	Farm	3,234	7,974	2,200	4,087	175
·34	Maistry	2,959	6,508	2,661	5,364	193

There is further the question of time. From observation it seems fairly certain that the earlier the crop is planted, the bigger will be the yield, because paddies planted at considerable intervals seem to ripen generally at about the same time. This is not to say that there are not differences in the different varieties, but those differences are largely dependent on the times at which the paddies are planted in the particular districts in which they are grown. The changes which may occur when a paddy is transferred to another district, or to another season, are well known, and instances may be gathered from our experience here.

This being granted then, the farmer is placed in a position of some difficulty. If he cannot grow a green manure crop, he will have to forego green manuring, or spend much money on buying leaf: if he waters the land for the green manure crop he runs the risk of damaging his land in the operation, while if he waits until irrigation water is received, he may be late with his crop. It is more and more recognized that it is sound policy to depend upon a separate water supply, such as a well, for the preparation of seed-beds, so that no time will be lost in getting started as soon as water is received; if a green manure crop is to be grown, six weeks or two months may be lost.

This does not exhaust all the problems which this interesting crop provides. The question of a hot weather ploughing (without irrigation) is still a matter to be decided, while such problems as the amount of green stuff which the crop can take, the effect of continuous heavy dressings of leaf and the effect of the different sorts of leaves are yet unsettled. As noted above, the land available for experiment is very uneven, but with a view to provide opportunity for the investigation of these and similar problems, plots have been arranged in block B and in block N for standardisation. Both have been newly laid out, and a considerable amount of levelling has had to be done, with the result that the yields are very irregular. In block B the *total* weights—it was not thought necessary to thresh the plots separately—vary from 7,200 lbs. to 4,380 lbs. per acre, and it is consequently useless to attempt any experiments yet. The plots in block N are worse and it seems rather doubtful if they will ever became standardised, but as it is difficult to find land that from its appearance seems likely to satisfy conditions, they will be cropped another year before deciding; the variations in the total yield was from 4,280 lbs. to 1,730 lbs. the fields will be the better for a good dressing of leaf all round.

16. *Paddy varieties.*—The collection of paddies made for educational purposes, and known as the students' variety plots, extended this year over a hundred separate plots. All of these are now 'unit' strains, that is to say, they have been obtained by reproduction from a single plant. These paddies are an excellent object lesson, and display the greatest variety in period of growth, habit, colour, yield and quality. "Carolina" paddy received from Ceylon was included this year: it must be many years since this formed the subject of experiment at a Government Farm. Besides these students' plots, there were forty-eight new selections made during the previous season, and planted out in small squares. Formerly selection was made more or less at random and any plant displaying a marked difference from its neighbours was chosen; now that the system is in working order, and the staff are trained to the work, more care will be expended in the more difficult task of picking superior plants in the common varieties of the district. The whole of the Sadai Samba and Sinna Samba seed used on the wet lands this year were unit strains—Sadai Samba No. 20 and Sinna Samba No. 22. No. 20 was originally a plant found growing in a water channel, which possessed extraordinary development; it had upwards of 200 culms. It was picked largely to save delay, as the amount of seed it provided was very large. This will now have to be tested against the new strains picked year before last and sown in small squares this year: Nos. 106 to 111. In the same way Sinna Samba No. 22 will have to be tested against the new selection Nos. 112 to 117.

The sowing and harvesting of these unit strains, which as noted above now comprise a very large number, entail a considerable expenditure of time and trouble which the farm staff can hardly afford. This year for instance, the progeny of the single plants were all planted in small squares separated from each other by a strongly marked early maturing variety: this was done to avoid any possibility of cross fertilisation and avoid accidental mixing during harvesting, and was found satisfactory; but it necessitated very careful supervision. The trouble is not over when the seeds are harvested and stored, as they have at times to be taken out and dried, and most careful precautions have to be taken to keep them from getting mixed by wind or by birds or any other way. This is not difficult, but again necessitates care and personal supervision which all mean time. The erection of a new vermin-proof seed store, with a netted drying floor, will very greatly assist in this work, and the appointment of an Economic Botanist will enable more rapid progress to be made. There is hardly a crop grown on the Farm, in which very great improvement could not be made by seed introduction, seed selection and crossing.

Besides this work, a few well-known varieties which seem to be suited to the place are kept for distribution. The best of these is probably Thurpu Sanna Akkullu which has been used for the past two years for the manurial plots. It was originally imported from the Gōdāvari and seems to be changing its habit and gradually improving in yield, it gives a fine white rice. Another variety which is improving is Tanjore Sirumani, a variety with very fine small white rice, a low percentage of husk. They all yield at present less than the standard local varieties, and the extra price paid for their quality, does not yet make up for this deficiency. Their yields are shown below:—

TABLE VIII.

Paddy varieties.

Variety.	Yield per acre.	
	Grain.	Straw.
	lbs.	lbs.
Sadai Samba	3,552	4,822
Tanjore Sirumani	3,326	4,206
Garudan Samba	3,031	4,400
Anna Samba	2,992	4,140
Anai komban	2,802	4,040

17. *Cholam* (*Andropogon sorghum*).—The crop was sown on rather larger area than last year, in order to meet the increasing demand for fodder from the breeding herd. Peria maajal (large yellow) again occupied the largest area, nearly 79 acres out of 87 being sown with this variety. A sharp distinction must be drawn between the early and the late sown crops, as practically none of the latter have given any return in grain, and only a poor yield of straw. Intermittent showers enabled sowings to be done in the red soils in the latter half of July. Germination was good, but the dry weather following indicated rigorous thinning and this was done, and with continuous bullock hoeing in the ridges, the crop grew well. Though it was unfortunately damaged severely by the heavy rains of November, the yields have been good, the average for the whole area being 686 lbs. grain and about 6,000 lbs. straw. The best yield recorded was in No. 7, where 1·75 acres gave at the rate of 1,372 lbs. per acre.

The Thalaiviriehan cholam again gave a heavy yield of over 1,000 lbs. grain: unfortunately the straw is worthless so that its cultivation

cannot be extended and is confined to the tracts near the hills, where forest grazing is available. It should be possible to unite the cropping powers and the quality of this cholam with the fodder qualities of peria manjal and thus build up a new and superior variety. All the above refers to the early sown crops: the late sown crops were complete failures. It was considered that the land was too dry for sowing the black soils and accordingly sowing which had been begun in F. No. 13, was stopped. The rest of the field was sown a month and a half later in the middle of September. In this field the early sown portion gave 391 lbs. of grain per acre, the late sown gave only 60 lbs. and this was only collected because it was of importance to obtain the seed which was of a selected strain. The delay in sowing was an error in judgment, for which I am responsible, but conditions vary so much each year that it is difficult to foretell what is best to do. As a matter of fact, in a previous year early sown cholam in the students' plots in the next field had failed, while the late sown fields had succeeded.

The crop up to the end appeared healthy and gave promise of a good yield, although in places, the weeds, encouraged by the late rains, were very bad, but the heads were affected by the honey disease and practically no grain was set.

The progress made in seed selection received a severe set back from this failure. The earliest selection No. 7, was sown on a fair scale this year, and occupied 4·5 acres yielding 2,790 lbs. of seed. This is at present to be used as the standard variety, and is available for distribution. The next year's strains, those picked in 1910-11 were three in number, Nos. 61, 62 and 63. They were grown in duplicate plots on both the black soil (Field No. 13) and on the red soil (Field No. 64). On the black soil they were sown late and yielded poorly, while on the red soil they failed to set seed, though they grew in a most promising way. As a result, we have 245 lbs. of 61 and 194 lbs. of 62: No. 64 it has been decided to reject.

The new selections (1911-12) fared little better but a few ounces of seed have been preserved for next year. Plots will be arranged next year to compare No. 7 with Nos. 62 and 63.

Progress with the Thalaivirichan cholam selections has been less promising. In 1909-10 six selections were made, Nos. 28, 29, 30, 31 43 and 44. Only two of these were kept on next year, 31 and 44 and no fresh selections were made. No. 44 was rejected next year, and there were at the beginning of the year under report, only No. 31 and three new numbers 73, 74 and 75. The plot of No. 31 failed completely: of the other three, only 74 is kept and of that only a few ounces.

The American sorghums fared equally badly, and practically set no grain; some seed has been saved from the previous year's crop, which still possesses fair germinating power, which will be used for the coming season. The selections are largely lost. Dwarf Milo 77 being the only one kept: No. 87 the produce of what appeared to be a natural cross, is the only other one kept for the next season.

18. The rotation experiments (see Table XX in last year's report) may be mentioned here, as cholam was grown on both the plots. There seems to be an indication that the pulse is having an effect on the subsequent cholam.

TABLE IX.

Rotation experiments.

F. No.	Rotation.	1908-09.		1909-10.		1910-11		1911-12.		1912-13.	
		Grain.	Straw.	Castor	Lablab	Grain.	Straw.	Castor	Lablab	Grain.	Straw.
		LBS.	LBS.	LBS.	LBS.	LBS.	LBS	LBS.	LBS.	LBS.	LBS.
1.	Cholam, Castor and Lablab ..	578	3,126	165	81	536	3,009	36	189	850	5,053
2.	Cholam, Castor.	580	3,201	185	...	562	3,922	272	...	573	4,392

19. *Chitrai cholam.*—This is an irrigated crop raised in garden lands in the hot weather. It is sown towards the end of March, the sowing season lasting this year from the 25th March to the 16th April; this last however suffered from being sown too late. Harvest took place in the middle of July, the crop occupying the ground for three and a half months. The season was dry and the harvest unusually good, the best yield being over 3,000 lbs. of grain per acre from Field No. 44. In such conditions, though the cost of irrigation becomes heavy, the yield seems from experience here, to be generally good. The more regular supply of water enables the plant to grow uniformly, while dry sunny weather helps in the process of fertilisation and ripening.

The experiments included the customary comparison between the furrow and bed systems of irrigation, and an experiment in transplanting instead of sowing the crop. The results are tabulated below and show a slight advantage in favour of the beds.

TABLE X.

Irrigation experiments Cholam. F. No. 18, *1912–13.*

Chitrai Cholam.

Plot No.	Area cents.	Treatment.	Water used in cubic feet.		Yield per acre.			
					Plots.		Average.	
			Per acre	Average per acre.	Grain.	Straw.	Grain.	Straw.
					LBS.	LBS.	LBS	LBS.
1	15	Beds.	6,625	29,584	2,552	7,408	2,600	7,632
4	15	Beds.	8,166		2,648	7,856		
2	20	Ridges.	6,658	27,564	2,404	7,120	2,518	7,088
3	20	Ridges.	7,125		2,632	7,056		

The planting experiment was initiated to obviate the difficulty of sowing a crop which needs a sprout irrigation on the crest of a furrow. In the irrigation experiment the seed was dibbled by hand, and water was

let into the furrows in sufficient quantity to soak up to the crest and start germination, but where land is at all rough, and this is likely to be the state of things when it is prepared in the hot weather, germination is not very satisfactory. In this particular case, an even stand was procured, owing to a shower received soon after sowing. The various methods in which the problem may be solved were outlined in last year's report, but it is clear that could the crop be transplanted the difficulty would not occur. The result obtained by transplanting this year was as follows:—

TABLE XI.

Transplanted Cholam F. No. 53.

Area of Plot.	Treatment.	Yield per acre, grain.
ACRES.		LBS.
1·25	Broadcasted.	2,434.
1·25	Transplanted.	1,738.

It was noted that transplanting seemed rather overdelayed, and better results would no doubt have been obtained had planting been done 15 days after sowing instead of waiting three weeks. This will of course vary from season to season, and this year the seedlings were particularly well grown. In any case, the mistake was not made of allowing the planted portion some extra time to allow for the set back of planting, and this will be attended to this year. Observation of the crop showed that the planted portion was very thin, and though it yielded fine large heads, it could not make up the loss. The experiment is however hopeful and will be continued.

The precaution was taken of treating all the seed this year with copper sulphate before sowing, and though smut was seen, it was only to a very limited amount.

20. *Fodder cholam.*—As noted in last year's report, the problem of providing fodder for the increasing stock is becoming more serious. It is probable that the milch cattle now do not get as much green fodder as they should. Cholam is found to be the most valuable fodder crop and the one giving the largest returns. The straw of the ordinary dry crop is of course one of the best of the ordinary fodders, and when it failed as it did this year, over a large area, the deficiency has to be made good by growing a larger area under irrigation in the ensuing hot weather. Local practice, and this is confirmed by experience on the farm, recommends peria manjal the ordinary dry variety, for this purpose, as sown at this season, it does not flower but produces a heavy crop of leaf and stalk. For other seasons, *kattu cumbu* is preferred.

The crops grown during the year were mostly on the land in the south-western corner, around well No. 60. The arrangement is to grow cholam continuously, three crops in the year, with fairly liberal manuring, so that the crops may be heavy, and also that the hariali (*Cynodon dactylon*) grass may be brought to the surface and eradicated. This system of dealing with the pest is borrowed from the Tinnevelly practice of sowing a thick crop of fodder cholam (*chola nathu*) on black soils as a rain fed crop: an improvement introduced

at Koilpatti has been to manure with saltpetre to induce a leafy development. The rain is not sufficient here as a rule, to enable this to be done, and with irrigated crops, the matter is much less certain, but the grass is gradually being brought to the surface where it can be dealt with by the ordinary methods of cultivation. In one field No. 8, a very large expenditure up to Rs. 30 an acre, has been incurred without success in trying to get this grass out. So bad is it, that it is a common practice in some gardens, to flood the land and grow a crop of paddy in order to kill the grass. This system was tried here and proved *successful*.

Poudrette is being used at present as a forcing manure for the hot weather crops, it being important, under irrigation to obtain as big a crop as possible.

21. *Wheat.*—The area under wheat was again reduced to allow for a further extension of Cambodia. Eight acres only were sown.

The crop suffered from the very severe rains of the end of November and one field had to be entirely resown: in the others seeds were dibbled in to fill in the gaps. The results all round have been poor, the best yield being only at the rate of 1,518 lbs. per acre. The price of wheat largely depends on the way in which the grains fill and is estimated by the volume weight; the farm crop was better in this respect this year; a salagai (64 Madras measures) weighing up 132 lbs. as against 110 to 115 in previous years. The reduction of the area under wheat which has occurred throughout the district, has also tended to raise the price of this crop: in 1910–11 the farm crop fetched as little as Rs. 4–0–0 per salagai, this year the price has reached Rs. 6–12–0. The only experiment with the crop was the standard ridge and furrow irrigation experiment which was carried out in Field No. 18. The results which are given below, have confirmed the results of previous years, that we cannot raise as big a crop by watering in furrows, as in beds. This year by mistake, the students who were harvesting the plots, mixed the produce of the duplicates.

TABLE XII.

Irrigation Experiments—Wheat Field. No. 18—1912–13.

Plot number.	Area cents.	Treatment.	Water used in cubic feet.		Yield per acre.	
			Per acre.	Average.	Per plot—Grain.	Average—Grain.
					LBS.	LBS.
1	25	Ridges	51,300	50,000	...	1,358
4	25	Ridges	49,800			
2	25	Beds	64,032	65,600	1,696	1,774
3	25	Beds	67,200		1,852	

22. *Ragi* (*Eleusine coracana*).—The area under this crop this year was 25 acres. Planting was done towards the end of June and through July, but the crop suffered rather severely from drought in its younger stages. The whole of August and nearly half September were practically rainless and the cost of irrigation together with the reduced yield has made the profit from this crop less than usual.

The permanent manurial experiments in *Field No. 6* were continued, but it was impossible to attend to them properly in the matter of irrigation, owing to the large demands made on the well by the Botanical garden, where many of the cane varieties and new seedling canes had to be maintained. The results are given below, with the figures from the previous years.

TABLE XIII.

Permanent ragi manurials.

Number.	Plot.*	Grain yields per acre. Season. 1909.	1910.	1911.	1912.
		LBS.	LBS.	LBS.	LBS.
1	Sodium nitrate, 1 cwt. per acre ...	2,925	Figures worthless.	2,050	2,375
2	Sodium nitrate, 1 cwt. per acre, and potassium sulphate, 1 cwt. per acre.	2,790		2,010	2,300
3	No manure	2,705		2,000	2,440
4	Sodium nitrate, 1 cwt. per acre, pots sulphate, 1 cwt. per acre, and superphosphate, 3 cwts. per acre.	2,950		1,800	2,650
5	Potassium sulphate, 1 cwt. per acre, and superphosphate, 3 cwts. per acre.	2,785		1,710	2,460
6	Superphosphate, 3 cwts. per acre ...	2,645		1,040	2,040

* One-twentieth acre.

The no manure plot again occupies a very high position but the figures are interesting as showing that the complete manure has again taken the first place. The land is undoubtedly still very uneven and it will take some time before the results become reliable: while the considerable irregularity this year in watering the plots has also disturbed the yields. The field is now being cropped uniformly with Cambodia cotton.

In another field the effect of a light dressing of ½ cwt. of crude saltpetre again gave a good return. The cost of the manure Rs. 1-6-0, brought in at least Rs. 20 worth of grain besides an increase in straw. As the need for some soluble nitrogen for this crop was demonstrated last year and has been generally indicated by the results of other manurial experiments, its use may be made general and adopted along with the other improvements which have been introduced in the cultivation of this crop.

23. One of the most important of these changes is the irrigation of the crop by means of furrows, on the ridges between which the ragi is transplanted, instead of planting the ragi on the flat in square beds into which the water is introduced in turn. The comparison of these two methods has been carried on methodically with each ragi crop with somewhat variable results. This can be partly attributed to the variation in the number of plants, which were found in 1911 as a result of actual counting to be less in the 'ridges' plots by about one third. Accordingly an experiment this year was arranged to obtain if possible

some idea as to the effect which might be allowed for by variations in the planting rate. Three spacings were adopted 100,000, 150,000, and 200,000 per acre: plots were laid out in duplicate in Field No. 45: the results are detailed below:—

TABLE XIV.

Ragi spacing experiments—Field No. 45.

Number.	Planting.	Grain.	Average.	Straw.
		LBS.	LBS.	LBS.
1 } 4 } ..	100,000 plants per acre	2,097 2,367	2,232	18,220 ...
2 } 5 } ...	150,000 plants per acre	2,027 2,357	2,192	17,250 ...
3 } 6 } ...	200,000 plants per acre	2,163 2,427	2,295	16,500 ...

Plots 40 cents.

It is clear that the more thickly planted plot is superior to the others and that there is, when the natural variation between the plots is taken into account, a fairly steady increase in the amount of grain as the planting becomes denser, correlated with a corresponding decrease in the amount of straw.

Plot 2 has suffered from a depression, in which the water has tended to lodge and the yield here should be a little higher, while the yield of Plot 6 is somewhat higher than it should be: there is probably little difference between the two thicker plantings which seems to show that the rate generally adopted for the beds, about 165,000 is the correct one. The figures for the ridges for the past years in which the number of plants has probably not exceeded 100,000 should be raised accordingly, when the superiority of this system will be more evident.

The figures for this year's irrigation experiment, with those of previous years, are given below: it will be noticed that only grain figures are given, as it is customary to cut the straw at different stages of ripeness, and the figures are not always comparable.

TABLE XV.

Irrigation experiments—Field No. 1912–13.

Ragi.

Plot.	1909.	1911.	1912.
	LBS.	LBS.	LBS.
Ridges	2,760	2,184	3,192
Beds	2,027	2,484	3,136

It is a matter for regret that there is some discrepancy in the figures reported for the current year, in that the original weights of heads as received from the field do not tally with the weights of grain thrashed out. The weights of heads are probably the more accurate figure and they give a greater advantage to the ridge planted plots, 7,204 lbs. to 6,015 lbs. from the bed-planted plots.

The saving in water is undoubted and is shown consistently by the figures quoted below which refer to the past five seasons except 1910).

TABLE XVI.

Irrigation experiments.

Ragi.

—	Number of waterings.				Cubic feet of water.				Total inches of water including rainfall during growth.			
	1908.	1909.	1911.	1912.	1908.	1909.	1911.	1912.	1908.	1909.	1911.	1912.
Ridges.	5	3	5	6	30,528	33,025	36,848*	30,816	21·06	14·90	14·99	17·1
Beds .	5	3	5	6	38,296	42,345	45,048*	44,200	23·41	17·48	15·83	18·6

*These figures were incorrectly entered in last year's report.

NOTE.—All figures per acre.

This experiment may now be considered to be definitely proved and the results will be published as a complete note. The information drawn from experiments conducted here with regard to the cultivation of this crop is roughly as follows:—It is economical to plant ragi on the tops of ridges and irrigate by running the water along the furrows between them: these ridges should be made level from end to end, *i.e.*, they should roughly follow the contour lines. Planting should not be at a lower rate than 150,000 plants to the acre and this rate may be increased. The use of fish manure has not been made the subject of very thorough investigation, but its use is considered excellent, and it has become here the general manure for the ragi crop. The manure is spread in the furrows, and the ridges are subsequently split so that the plants strike their roots down to the food supply immediately below the place where they are planted.

24. An experiment with an introduced variety known as Palur ragi, was carried out in Field No. 50 this year. Fifty small plots were laid out and were planted alternately with Palur and the local variety in order to arrive at some idea as to the amount of variation which might be expected, and the number of plots necessary to eliminate errors. The total weights of the earheads only were taken, as it was not possible to arrange for the separate threshing of so many plots. The figures await examination.

A single field of dry ragi was sown, but as was after all to be expected, failed completely. Dry ragi is so generally considered superior

both as regards the grain and the straw, to the irrigated, that were it at all a safe crop, it would be found extensive.

25. *Cumbu* (*Pennisetum typhoideum*).—The crop is grown both on garden and dry lands: it is a valuable grain crop but the fodder is considered of no feeding value and is burnt or used for thatching. The local crop, known as kattu cumbu, has been now entirely ousted on the form by a variety first introduced by Sampson from South Africa, and known as Transvaal cumbu. This is a quickly maturing—two to three months—prolific variety, with rather larger grains than the local one, and has the further advantage that the straw is more palatable. It may be grown either as a dry or a garden crop—as the latter it may be either drilled or transplanted. This year, on the irrigated lands, the best yields have been about 800 lbs. per acre: these are good, but not so good as in previous years. The dry crop, owing to the drought in August, was a failure.

The plants have changed somewhat their characteristics: they seem to have lost their power of tillering, and have become shorter both in height and period of growth. This change may be due to cross-fertilization, which is common in this crop, and for which numerous opportunities have been afforded by the comparative trials which have been made between this and the local cumbu. It is certain that the crop is now very mixed, and fresh seed has been imported this year by Sampson from Messrs. Vilmorin & Co., two varieties—"*Early African*" and "*Catstail*" being received. They will be sown to ripen at different times, and thus avoid risk of crossing.

26. *Italian Millet*: (*Setaria Italica*).—As a pure dry crop a yield of 870 lbs. of grain per acre was recorded from field No. 24, while in 48 where the crop was irrigated, 1,705 lbs. was obtained. The crop was also sown mixed with tenai in No. 10, but suffered in the drought.

An interesting trial was made in No. 54 between two unit strains and the ordinary mixed sample, on a fairly large scale. Six plots were laid out in long narrow strips running north and south, each 40 cents. in area, and the above were sown in duplicate. The results are shewn in the accompanying table.

TABLE XVII.

Unit strains of Tenai in Field No. 54.

Plot.	Strain.	Grain.		Straw.	
		Plot.	Average.	Plot.	Average.
		LBS.	LBS.	LBS.	LBS.
1 5	No. 2	248 367	307½	592 712	652
2 6	No. 4	385 435	410½	520 592	556
4 8	Farm Ordinary	376 428	402	596 576	586

It will be seen that the results of selection have not been very marked. From a consideration of the arrangement of the plots, it is seen that the 'Farm ordinary' obtained a benefit from its position, so that the strains are probably a little superior in this respect, but the results are disappointing, the more so as the appearance of the plots when growing showed clearly the greater uniformity of the unit strains. The quality of the grain shows little variation, while the proportion of husk is almost the same in each case. All that can be said is that the method of selection is correct and sound, as was evident from the uniform appearance of the crop whilst growing, but that greater care must be taken in the selection of the individuals to start the strains. Of the two strains now under trial No. 4 will be kept to be compared with subsequent selections.

27. *Other cereals.*--Continued trial with exotic maizes has this year resulted in a partial success. A crop of Brazilian flour corn was sown in September and the cobs were picked green throughout December and realised a handsome profit. A fodder crop sown in the hot weather failed to show any profit. There is an exceedingly limited scope for the introduction of maize in this district, which does not seem to suit it, and only a small area for growing as a vegetable will be tried next year.

A field of *Panicum miliaceum* was grown in 52-A between the 10th of January and the 2nd of April. It has produced over 1,000 lbs. of grain per acre, which is high for this inferior crop. Numerous other cereal varieties were as usual grown on a small scale in the Students' series for educational purposes.

28. *Pulses.*—Bengal gram (*Cicer arietinum*) occupied the largest area, being sown over 32 acres of dry and 8·7 acres of garden land. The exceptional late rains in November delayed sowings, so that the crop was not all got in, until the end of the first week of December. The crop was satisfactory and yielded a little over 300 lbs. per acre, the same as last year. Sowings on the garden soils were not so successful as last year, and very low yields are reported in most cases.

Redgram (*Cajanus indicus*) is the next most important pulse, and whereas bengalgram is sown last on black soils, this pulse is sown early on red soils. It was sown on the 28th July in Field No. 10, over 7½ acres, mixed with Italian millet (*Setaria italica*) and yielded over 500 lbs. per acre. Another early-sown field gave over 350 lbs. per acre.

Unfortunately, the strains selected by the Government Botanist were not sown early through an oversight, and could not subsequently be sown until the middle of September with the result that they have fared rather badly. The work of selection has increased in complexity and the number of varieties is now very large.

American cowpeas did well, and seem most promising. The two varieties which have been kept are "Iron" and "New Era." The former seems a satisfactory cropper, the latter is a more leafy variety which can be used if needed, for green manure or as a smother crop. "Iron" cowpea was grown for fodder in Field No. 60, but was attacked with aphis. As we were short of seed, the crop was allowed

to ripen and gave the satisfactory yield of 423 lbs. per acre: sown later as a smother crop in No. 8 it gave a somewhat smaller yield of grain owing to the thick seedling, but it formed a very dense mass of stuff which fulfilled its object. A few selections were made and were sown in Field No. 56. They were badly neglected by the assistant in charge, and only enough seed has been obtained to make a trial next year.

The supply of seed for leguminous green manuring on garden and wet lands was also attended to.

Sunnhemp (*Crotolaria juncea*) was sown mixed with Transvaal cumbu in No. 11 and also here and there as a pure crop but failed to produce much seed.

Dhaincha (*Sesbania aculeata*) was sown in Field No. 43-A as a green manure crop, but it was eventually allowed to seed, and has yielded 270 lbs. of seed per acre which will serve to satisfy farm requirements. A certain amount was obtained this year from the wet lands, where the seed has been sown on the tank-bunds and in odd corners.

Sunnhemp was ploughed in as green manure in Field No. 17 which it proposed to bring newly under garden cultivation.

29. *Cotton* (1911–12).—The season was characterised by the unusual late rains of December and the heavy incidence of an insect pest *Pempheres affinis* (Fst.). This pest while effecting greater damage on Cambodia, also attacked Uppam cotton and in the case of the drilled and broadcast plots, so damaged them, as to spoil the experiment, and after some time, no trouble was taken to keep the produce separate. Generally speaking the cotton crop was fair, yields of 260 lbs. to 270 lbs. being recorded. There was a good deal of late sown cotton put in after early crops, which however failed and reduced the total yields. Only one mixed crop was grown, Italian millet and cotton being taken in Field No. 62. The millet grew very luxuriantly and yielded at the rate of 580 lbs. per acre, practically stifling the cotton which only gave a nominal yield. In order, if possible, to minimise the chance of future attacks of the pest, the whole of the farm was cleared of cotton by the end of June and all cotton refuse was burnt: no second pickings are therefore recorded.

One field was sown with Nadam cotton (*G. obtusifolium*) during the year, to serve as a demonstration. It was drilled in November 1911, and it was intended to leave it down for three years, the time which this perennial cotton is generally allowed to stand. Picking commenced in April next year and from then until September of the following year 200 lbs. of kappas had been picked. The growth was satisfactory, but in view of the risk of the crop harbouring the insect, it was decided to clear it: the field was accordingly grazed and the stalks then lifted and burnt. The crop is a very hardy one, and though it is attacked severely by the borer, does not suffer from it in the way that the more delicate Cambodia does.

Of more interest perhaps is the newly introduced Cambodia cotton, which appeared last year for the first time in the neighbourhood. The spread of this crop has been very rapid and it was remarkable

with what confidence and on what a scale it was grown the very first year of its appearance. This year it has occupied a very considerable area both on dry and garden lands.

The crop is one suited to red soil garden lands, where it can get an occasional irrigation, though as a matter of fact, the best farm crop was obtained from 54, a dark loam. This field was given a thorough ploughing to about 8 inches with one of the Gallows ploughs, and was then manured with 10 cartloads of farm yard manure. The seed was dibbled in plough furrows in lines about 2½ feet apart, on the last day of September. Picking began on the 11th of February, and continued until the end of June, when the crop was pulled out for the reason stated above, although a considerable further yield could have been obtained. A certain amount of irrigation was done to start germination, as owing to the deep ploughing, the land was rather open, but a heavy fall of rain on the 18th October renders a further irrigation unnecessary. After this, only one full irrigation was given, between the 21st February and the 7th of March. The value of the crop at the price given by Messrs. Stanes & Co., was Rs. 163 per acre and the cost of cultivation Rs. 45.

There are two points to which attention may be called. The first is the borer *Pempheres affinis* (*Fst*) referred to above. This particular field, No. 54 suffered the least of any, but even here the number of plants pulled out in an endeavour to check the attack was very large, while in the N block of the farm, one field almost completely failed and from the other only about 500 to 600 lbs. of kappas was obtained, the reduction being almost entirely due to borer. A further note of warning was sounded when this pest was discovered in large numbers on the ordinary annual Uppam cotton, which hitherto had been regarded as exempt; and there is no doubt that the temptation to keep the Cambodia too long in the ground on the chance of getting some small picking, will tend to the increase of the pest. All that can be said at present is that the matter is under investigation; some comfort may be had in the fact that the incidence of the attack is very much less in the current year.

The other point to which attention may be called was the marked appreciation shown by the local buyers, Messrs. Stanes & Co., of the quality of our cotton. The superiority of the Farm cotton over that which they could obtain elsewhere, was due to the simplest precautions such as should be taken by everyone: pure seed, the removal of any 'rogues' that appeared, ordinary care in picking, and the separation of the lint into two grades. The remedy for the mixed and impure samples which are spoiling the reputation of this cotton, lies with the trade. Nearly 4,000 lbs. of pure seed was distributed from the farm last year, and more could have been disposed of.

30. *Tobacco.*—A rather notable success has been obtained with this crop this year, the more so, as we have not been able to do much good with it hitherto. The field chosen was No. 5-C; our own bagged seed from the previous year was used, the seedbeds being prepared in No. 19-A. Heavy rains damaged the seedlings very seriously, though they were an extremely healthy lot, and in the end we had to obtain some from outside to complete the field. The crop was transplanted at

the end of November and proved most successful. A single bullock yoked to a Planet Junior hoe by means of harness obtained from a dealer in South Africa was employed to hoe the crop and make the irrigation furrows.

An attempt was made to sell the standing crop, but no reasonable offers were received and the crop was cut and cured by farm labour, yielding 7,616 lbs. green weight per acre. While curing was in progress an offer of Rs. 250 was received and the lot was sold. For the plot of 1·75 acres, the cultivation expenses were at the outside Rs. 150, so that the profit obtained, Rs. 100 for 1·75 acres, is at the satisfactory rate of Rs. 60 per acre.

31 *Fibres.*—*Hibiscus cannabinus* was simply grown to meet the current needs of the farm. It was sown in June but failed, and was accordingly re-sown in the third week in July. The crop has yielded only moderately: 592, 530 and 580 lbs. per acre in the three fields in which it was grown. The pure strain of red stemmed green veined divided leaf-gogu was the one used all through, as experience had shown that it was superior to the others.

32. *Oil-seeds.*—With the exception of the specimen plots grown for educational purposes in the students' series, the only oil-seed grown this year was gingelly. The uncertainty of the crop is as noticeable as last year; it was got in, as early as possible, in May and with two irrigations to help the monsoon showers, yielded in one field 580 lbs. per acre at a profit of over Rs. 30 per acre. In another field, where irrigation facilities for the sprout watering were poorer, the plant was thin, and the yield as low as 245 lbs. per acre.

A certain amount of castor was grown for supplying leaf to the eri silkworms kept by the Entomological section. The students' series comprised plots of safflower, red thornless, and yellow thorny, groundnut, four varieties, Senegal, Big Japanese, Mauritius and Madagascar; linseed and castor.

33. *Sugarcanes.*—The crop was grown in the 1911–12 season on an area of 3·10 acres, of which 2·25 acres were in block M and ·85 in block C.

Block M is a fairly high lying piece of land with fair drainage in places, which had carried canes in 1908–1909, three years before. The two intervening crops were paddy. It was noticed in block J, where the canes were planted in the previous year, that the upper beds, which had received a very heavy dressing of sunnhemp to the previous paddy crop, had given an excellent stand of canes, and as noted in last year's report, it was decided to try the effect of a heavy dressing of leaf before cultivation was started for the canes. As soon as the paddy was harvested, the land was flooded (water can generally be obtained at this time) and during February leaf was carted and applied at about 10,000 lbs. per acre. The land was kept puddled in order to aid in the thorough decomposition of this leaf, until the beginning of March, when it was dried and ploughed. Considerable difficulty was experienced in getting a tilth, and even after a number of ploughings, the clods had to be broken by hand. Timely rains assisted in the process

and the land was ridged with the Ransome's ridging plough: planting commenced in the first week of April and continued through the month.

A rather ambitious scheme of experiments was arranged continuing the previous year's work, and including manurial, varietal and cultural experiments. Unfortunately, the land proved very uneven, for reasons which are described below, and many of the results have had to be rejected for this reason. The manurial plots were designed to compare as before six nitrogenous manures, but this year groundnut cake was replaced by calcium cyanamide. Each manure was applied at a rate calculated to supply 100 lbs. nitrogen, while the whole area received 80 lbs. of phosphoric acid and 60 lbs. of potash in the shape of superphosphate and potassium sulphate. Planting was done on beds ten feet wide, separated by an irrigation and drainage channel one foot wide, the rows on the bed being four feet apart, while between the rows in adjacent beds was a space of five feet.

The details of the manures used and their cost are given in the table below.

TABLE XVIII.

Manurial experiment, 1911–12.

Sugarcane.

Manure.	Cost per ton.	Per cent. nitrogen.	Amount applied per plot of 11 cents.	Cost per plot.
	RS.		LBS.	RS. A. P.
Fish manure	60	5	220	5 14 3
Calcium cyanamide	200	20	55	4 4 7
Potassium nitrate	200	10	110	9 13 2
Black castor	60	5	220	5 14 3
Calcium nitrate	170	13	85	6 7 3
Ammonium sulphate ...	258	20	55	6 5 4

Germination was good all through, Vellai local white being used for all the plots. A novelty was introduced, in the intercultivation of the cane rows with a Planet Junior bullock hoe: it will be remembered that in planting the ridging was performed by bullock power, and in this way a considerable saving in expenditure was effected. Later on the rows of canes were propped by being tied to stout horizontal bamboos, which were supported at intervals by crossed bamboos.

The original intention was to conduct a series of ripening experiments on a separate plot of canes manured with fish manure, and when the canes were approaching maturity, to mill first the outside of the three rows comprising each plot, next the centre row, which was to be regarded as the true test, and subsequently the third row to note the effects of over-ripening. Owing to the ravages of red rot, it was

impossible to carry out this programme, while lodging occurred when the canes were too mature to stand being re-propped. The weights are given below:—

TABLE XIX.

Manurial experiments, 1911–12.

Sugarcane.

Manure.	1911–12.					1910–11.
	Number of canes.	Weight of canes.	Weight of juice.	Weight of tops.	Weight of jaggery.	Weight of jaggery.
		LBS.	LBS.	LBS	LBS.	LBS.
Fish manure	11,181	58,664	42,027	6,327	6,463·63	8,757·14
Calcium cyanamide ...	14,182	60,082	42,300	6,818	6,463·63	8,342·86
Potassium nitrate ...	18,955	59,618	41,018	5,673	6,176·36	7,885·71
Castor cake	13,545	53,672	40,145	5,891	5,618·18	7,585·71
Calcium nitrate	13,091	50,973	35,236	4,609	5,590·20	7,228·57
Ammonium sulphate ...	10,527	42,164	29,618	7,418	4,009·04	6,828·57

Plots 11 cents. All figures per acre.

A single analysis was made of each plot from the central row—

TABLE XX.

Manurial experiments, 1911–12.

Sugarcane.

Plot.	Brix.	Sucrose.	Glucose.	Co-efficient of purity.
Fish manure	17·14	13·23	2·50	76·60
Calcium cyanamide	17·63	14·71	1·72	82·50
Potassium nitrate	19·70	15·90	1·78	80·71
Black castor	18·47	14·96	1·72	80·99
Calcium nitrate	18·54	14·78	2·39	79·73
Ammonium sulphate	17·93	14·43	2·04	80·48

NOTE.—The samples were taken in each case from a complete boiling.

For the reasons given above, these figures are open to criticism, but are quoted to show in general how the plots stand. The jaggeries made were of a poor quality and were not analysed. The experiment is being repeated in the present years, but similar difficulties have occurred, and in the planting scheme for the coming (1913–1914) crop, no manurial experiments have been included.

34. The varieties, which were grown in block C, were still more unfortunate. The land had not previously grown cane, but was occupied by the two first plots of the permanent manurial experiments with paddy, and had in previous years been heavily dressed with green

leaf. The comparison between the leaf of wild indigo (*Tephrosia purpurea*) and Erukkam (*Calotropis gigantea*) had conclusively shown the superiority of the latter, and as the land was fertile and capable of irrigation from a well; it was arranged to test the varieties here. It was not known at the time, how bad the drainage was, and this lack of drainage proved an insuperable obstacle which resulted in a poor pale and stunted crop. With the greatest precautions, it was only possible to save some sets of all the varieties. Seventeen varieties were planted in all, including seven seedling canes, and two canes from Fiji, known respectively as Fiji B and Fiji C. The former is a very dark stout cane with rather reduced internodes: the latter is thinner and lighter in colour. Even in this small plot, there was a considerable amount of variation in the growth of the canes, due to differences in the porosity of the sub-soil; there being here and there patches of gravelly kunkar, which permitted of drainage. On the whole, the old Red Mauritius, a particularly hardy cane did about the best: some of the newer seedlings being very bad: B. 208 was one of the worst. Besides these, some of the major varieties were also grown in block M.

35. The experiment to compare two rates of planting was continued, and four plots were planted in duplicate at the rate of 10,000 and 20,000 sets per acre respectively. No weighments were made in the plots, as they were among the few healthy plots available, and all were used for planting the current year's crop. The general impression gained from inspection of the plot was that the more thickly planted plot was the heavier. In this district, the seed rate is often very high, over 30,000 sets being sometimes used, and any reduction would effect considerable saving. In order, if possible to induce more tillering, a plot was planted in trenches, and subsequently earthed up, but with the rather impervious soil which characterises the farm wet land, this system proved a failure, and the canes did not grow well.

A further experiment was designed to compare the practice of wrapping which prevails in some parts of Madras, with the more general practice of leaving the canes untouched; there is of course the further alternative of trashing which is found suitable to West Coast conditions. These plots, which were planted with several varieties, each of which was treated in the two ways noted above, suffered from Red Rot very badly, and no figures of any value were obtained.

36. This report, which is a record of practical failure, relates to the season ending in April last year (1912). Canes were planted this year in the southern portion of M and also in a part of K, an area of 2·82 acres and a similar scheme of experiments laid down. From a general survey of these, and the results of the four years' experience I have had here, I am compelled to conclude that this wet land is not suitable for growing canes except in small patches, which are now fairly well known. The land is certainly not fit for experimental purposes, as it is extremely uneven and all experiments have consequently been excluded from the scheme for the planting which is now in progress. The full figures for the current year's crop 1912–13 are not yet to hand; they will, it is hoped, afford certain results of value and interest, but after this, the area will be reduced and canes will be grown only for educational purposes.

37. A small piece of cane was also tried on garden land in 19 B, during the year. It was considered that as a result of our experience in cane growing, something might be done to show the local expert how canes should be grown on dry lands, as had been done in wet land conditions. Cultivation was started by growing and turning in a good crop of sunn hemp, after which the canes were planted in the middle of September, the time when planting is usually done in these lands. Fish manure was duly applied in the furrows and covered by splitting them back, and with the canes a top-dressing of dried blood and castor was given. Everything in fact was done that "the new agriculture" could suggest. Unfortunately the canes refused to grow and after various remedies in the way of manure, trenching had been tried, the crop was eventually cut for fodder in June of the following year, at a dead loss. It is easy to explain this failure by saying that the land was unsuitable but just why this was so, is a different problem. The experiment will not be repeated, at least for some time.

The permanent manurials.

These were continued on the lines already laid down: the scheme of manures is outlined in the table given below:—

TABLE XXI.

Permanent manurials.

No.	Treatment.	Supplying.		
1	No manure	...	...	...
2	Ammonium sulphate 1 cwt. per acre	N.	...	...
3	Ammonium sulphate 1 cwt. per acre ... / Potassium sulphate 1 cwt. per acre ...	N.	K.	...
4	Ammonium sulphate 1 cwt. per acre ... / Calcium superphosphate 3 cwts. per acre	N.	...	P.
5	Ammonium sulphate 1 cwt. per acre .. / Potassium sulphate 1 cwt. per acre ... / Calcium superphosphate per acre ...	N.	K.	P.
6	Potassium sulphate 1 cwt. per acre ... / Calcium superphosphate 3 cwts. per acre	...	K.	P.
7	Potassium sulphate 1 cwt. per acre	...	K.	...
8	Calcium superphosphate 3 cwts. per acre ...	...	...	P.
9	Cattle manure 5 tons per acre	N.	K.	P.
10	Cattle manure 5 tons per acre (this will be stopped after some time to test the residual effect of this dressing).	N.	K.	P.

The crops hitherto taken have been

TABLE XXII.

Permanent manurials.

No.	——	Sown.	Harvested.
1	Peria manjal cholam (*Andropogon sorghum*).	18th September 1909.	3rd January 1910.
2	Pani varagu (*Panicum miliaceum*) ...	12th February 1910.	2nd May 1910.
3	Transvaal cumbu (*Pennisetum typhoideum*).	18th May 1910 Transplanted.	3rd August 1910.
4	Ragi (*Eleusine coracana*)	Transplanted 7th August 1910.	2nd November 1910.
5	Wheat (*Triticum sativum*)	6th December 1910.	24th March 1911.
6	Chitrai cholam (*Andropogon sorghum*).	3th April 1911...	24th July 1911.
7	Gogu (*Hibiscus cannabinus*)	11th August 1911.	18th December 1911.
8	Pani varagu (*Panicum miliaceum*) ...	24th December 1911.	20th March 1912.
9	Chitrai cholam: white (*Andropogon sorghum*).	30th March 1912.	19th July 1912.
10	Ragi (*Eleusine coracana*)	25th July 1912 Transplanted.	29th October 1912
11	Wheat	10th November 1912.	11th March 1913.
12	Chitrai cholam	28th March 1913.	.....

The yields of these crops and the previous ones which it is thought worth recording are given below :—

TABLE XXIII.

Permanent manurials.

Plot number.	Area, Cents.	Treatment.	Crop No. 4.	Crop No. 5.	Crop No. 6.	Crop No. 7.	Crop No. 8.	Crop No. 9.	Crop No. 10.	Crop No. 11.
			LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.
1	4	*Nil*	750	850	1,025	350	1,062½	1,400	900	450
2	4	N	1,100	1,350	1,850	675	1,037½	1,725	1,275	850
3	4	N + K ...	1,025	1,250	1,250	750	887½	1,850	1,150	800
4	4	N + P ...	1,025	1,850	1,650	900	1,032½	1,875	1,150	875
5	4	N + K + P ...	1,475	1,825	2,125	800	1,112½	1,900	1,375	950
6	4	K + P ...	1,550	1,350	1,550	600	787½	1,900	1,375	750
7	4	K	1,475	1,175	1,425	650	812½	1,375	1,100	525
8	4	P	900	1,400	850	900	787½	1,125	1,075	600
9	5	Farm yard	1,260	1,300	1,800	600	990	1,080	1,600	400
10	6	Do. ...	1,683	900	2,017	633	925	1,850	1,310	383

These figures are for grain only, and are given as a record and a guide for future reference. Samples of all the crops have been secured and carefully bottled, while the proportion of husk has also been made. The results are however not yet ripe for discussion.

38. *Cattle.*—A steady increase in the herd is to be recorded during the past year and we are in a position now to begin to pick and choose, and so, by selecting the better animals, to raise the average of the whole herd. Cows, including buffalo cows and in-calf heifers, rose from 51 at the beginning of the year to 67 at the close. 14 new animals were bought, 6 transferred from young stock, while 2 were sold and 2 died. The process of selection will be facilitated by a new register which is just being opened, from which the whole history of each cow, including her performance at the pail, both in quantity and quality will be visible at a glance: this has been rendered possible by the analyses which are now being regularly made in the dairy, and which will enable an immediate reduction to be made in the numbers now kept, as there are certainly a number of animals who do not pay for their keep.

In the young stock class, the number rose from 56 to 93: there were 46 births during the year, more than twice the number in the preceding year. The proportion of males to females was 26 to 20. Two animals were promoted to the 'Bulls and Bullocks' and 6 to cows and heifers. 9 animals died during the year and 8 were purchased, so that the young stock at the close of the year stood at 93.

The stud Bulls have been heavily used during the year. The old Kangayam bull, Mappillai, maintained his position as the head of the herd, but just at the close of the year, a young bull was bought from the Pattagar of Palayakottai to take his place, and this animal, though as yet young, is of the right stamp. It is hoped that it will be some time, before we shall again have to go outside for a stud bull for our Kangayam animals, as the supply of such is entirely in the hands of the Pattagar either directly or indirectly, and though he has on all occasions been most willing to oblige us, one likes to feel more independent.

The second Kangayam bull, Tamar, is a much poorer class. Basha is a dairy bull, of the Baggiam strain so largely represented in the Dairy side of the herd, while Rangan is an Ongole bull who stands at stud for country cows brought to the farm. The two buffalo bulls, named Meeram and Buddha, are now at stud and keep remarkably fit. Three buffalo calves have been dropped to them, from our own buffalo cows and these seem to take after their sires, so far as size and bone are concerned.

A bull has recently been purchased, through the kindness of Professor Knight, from the Poona College Dairy, a young Gir animal, whose dam and grand-dam on the sire's side, are both known good milkers. This animal is at present in quarantine at the Veterinary Hospital at Madras.

An outbreak of foot-and-mouth disease is just subsiding. We had an attack in August 1908, and again in March 1910. The disease was probably actually introduced through some animals purchased at a fair outside; the usual precaution of keeping them in quarantine was adopted, but the avenues of infection are so many that in the case of this disease infection was inevitable. The results have been rather more serious than before. Five deaths, mostly among young animals occurred, including the Ayrshire heifer mentioned in my last report: death seemed

in most cases to be due to pulmonary complications. Statistics show that no immunity is conferred by one attack, as of 144 animals attacked this year, 31 had suffered in 1910.

Considerable anxiety was felt from an outbreak of black-quarter which broke out in a village a few miles to the west of the farm, and seemed to be gradually spreading towards us. The Veterinary Authorities dealt with the matter promptly, and though a quantity of vaccine was obtained and held in readiness, no occasion was found for its use.

An experiment was conducted under the direction of the Veterinary Assistant, to determine the increased value which fodder would possess when properly chaffed by machinery. Although carried out carefully, this experiment led to no results, owing to the large individual variation of the animals. A note has been contributed to the Agricultural Journal on the subject.

Outside cases continue to increase, owing largely to the improved accommodation and greater conveniences afforded by the new hospital. In August, the Veterinary Assistant, moved into the building, and since then with the erection of a notice board, the fixing of regular hours and the appointing of a compounder, work has largely increased; 486 cases were treated as against 270 in the previous year. This is valuable from an educational point of view, and it also brings to the farm, many who would not otherwise come. While waiting for their own or their animals' ailments to be treated, visitors often put in the time watching some of the machinery at work in the yard or talking over things with the maistry, and thus a knowledge of the farm, and the realization that it is there to help, becomes diffused through the neighbouring villages. Mr. S. L. D'Silva has indeed won their confidence in a very marked way, and I am glad to be able to report that a compounder has been appointed to assist him. An increasing number of cows are also being brought for service, and this in spite of the rise in the fee from four annas to eight annas. The smaller fee was fixed from April 1st, and was raised from July 1st: 250 cows were brought for service as against 215 in the previous year; 196 cows took the bull; the fees taken amounting to Rs 79–12–0.

The valuation of all the livestock at the close of the year was Rs. 16,322 as against Rs. 12,686 at the close of last year.

Sheep.—The crossed Merino ram mentioned in previous years is still in the keeping of the estate shepherd, and still runs with a flock of fifty selected ewes. Forty lambs are said by the shepherd to have been dropped to him this year, 25 ewe-lambs and 15 ram-lambs.

The two ram-lambs which were to have taken the place of the old lamb have, it is said, died though it is much more likely that they have been sold. The experiment has not been without interest, but it is difficult to control a shepherd without spending some time with the sheep and getting to know both him and his flock; and unless more time can be found for this, it is not proposed to continue the experiment, though a Merino ram from the hotter drier parts of Australia, might have a fair chance of success, judging from the appearance of the lambs born to the farm cross-bred Merino ram.

R. CECIL WOOD,
Principal.

APPENDIX I.

Statement showing the mean temperature, highest maximum, lowest minimum, humidity and rainfall at the Agricultural College Meteorological Observatory for the official year 1912–13.

Period.	Mean maximum in shade.	Mean minimum in shade.	Highest maximum in shade.	Lowest minimum in shade.	Mean temperature at 8 A.M.	Mean humidity at 8 A.M.	Total rainfall.
	°F	°F	°F	°F	°F	Per cent.	Inches
April 1912	97·6	75·2	99·7	59·8	80·3	89	0·66
May ,, ...	95·7	74·1	98·8	3·8	80·7	81	2·47
June ,, ...	89·1	*73·5	96·2	*85·1	79·0	74	1·77
July ,, ...	85·9	71·4	90·7	62·9	77·3	72	0·34
August ,, ...	87·2	71·6	92·0	63·6	77·4	72	2·79
September ,, ...	87·9	70·5	92·5	60·8	76·6	78	3·37
October ,, ...	85·2	70·1	88·5	62·2	75·0	85	7·75
November ,, ...	84·1	67·2	87·8	61·2	73·7	81	12·50
December ,, ...	82·5	63·7	85·9	56·9	70·5	78	0·03
January 1913	84·0	61·4	87·1	53·4	69·5	71	...
February ,, ...	88·7	66·6	95·0	57·9	75·0	75	...
March ,, ...	95·4	67·9	101·1	60·9	76·7	65	0·21
Year (1912–1913)	88·6	69·2	101·1	53·4	75·8	77	31·89

* The minimum temperature records for the last 10 days of June have not been correctly maintained; hence these figures refer only to the first 20 days of the month.

APPENDIX II.

Profit and loss account for the year ending 31st March 1913.

Dr. *Cr.*

	Rs.	Rs.		Rs.	Rs.
			By Receipts		19,580
To amount as per valuation—March 31, 1912—			By amount as per valuation—March 31, 1913—		
Dairy *	6,711		Dairy *	8,988	
Live-stock † ...	5,685		Live-stock† ...	7,194	
Tillages and standing crops.	2,605		Tillages and standing crops.	2,722	
Produce in store ..	4,665		Produce in store...	4,933	
Implements ...	3,677		Implements	6,077	
Machinery ..	15,655		Machinery ...	16,418	
Buildings and estate improvements.	40,080		Buildings and estate improvements.	57,139	
		82,028			1,04,401
To charges during the year.		36,787			
To balance being profit.		5,166			
Total ...		1,23,981			1,23,981

* Includes the dairy herd and stud bulls. † Working cattle only.