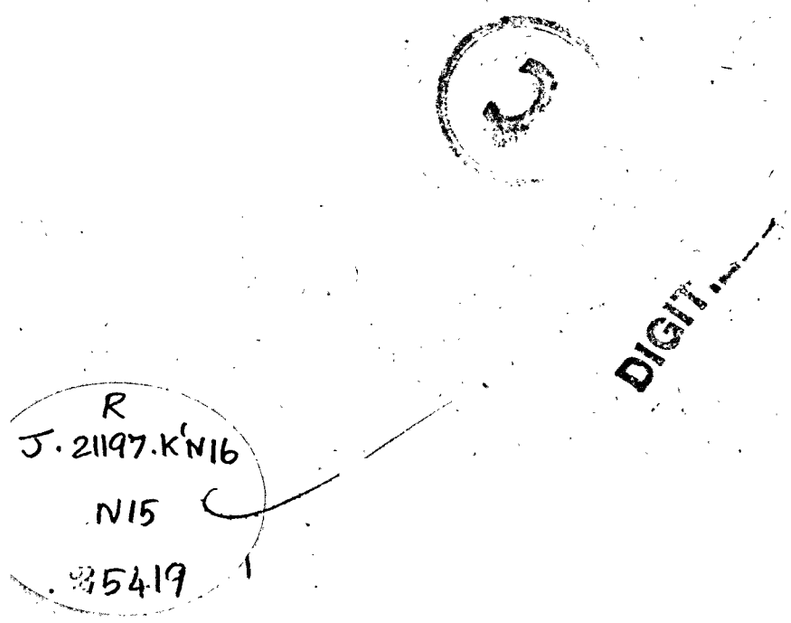
Report of the work of the Koilpatti Agricultural Station For-1914-15



REPORT OF THE WORK OF THE KOILPATTI AGRICULTURAL STATION FOR 1914–15.

An account of the agriculture of the tract represented by this agricultural station is printed as an appendix to this report.

2. *The season.*—A statement of the rainfall is printed as Table No. 1 of the appendix. The hot weather rains were favourable and a good summer yield of cotton was obtained. The north-east monsoon commenced with a few light showers in September with a fall of $1\frac{1}{4}$ inches on the 20th and with the help of this, the crops on the red soil were sown. Throughout October till the 10th of November dull and cloudy weather prevailed, which hindered all field operations. During this period $15\frac{3}{4}$ inches of rain fell and rain was recorded on 29 days. The latter half of November was fine but rain set in again in the beginning of December when a total of 7 inches fell in the first 7 days of the month. Rain at this time was very inopportune. All the crops were just beginning to grow vigorously as the land began to dry. The cotton at this time should have been sending its roots down. This heavy rain, however, again left the land sodden and checked all root development. The cumbu crop also should, at this time, have received thorough inter-cultivation without which it will not tiller; but this was impossible till later on in the month when it was too late. This agricultural station just caught the edge of the severe cyclonic rainfall which caused so much damage further south and $2\frac{1}{2}$ inches of rain were received on the 23rd and 24th of December. Again this rain was not wanted. It washed off much of the pollen from the cumbu which was then in ear and prevented the grain setting properly and it again prevented the cotton crop from sending its roots down. The total north-east monsoon rain was 26·60 inches against an average of 17·71 inches. As usual, January was fine and bright and the cotton crops made vigorous growth. In February, however, owing to the check in root development, this crop began to suffer, but fortunately a rainfall of $1\frac{1}{2}$ inches was recorded at the end of the month, which, for the time being, saved the situation, but elsewhere in the cotton tract where this rain was not received the cotton crops have suffered severely.

3. *Cereals grown with pulses versus cereals grown as a pure crop.*—This experiment could not be conducted this year owing to the delay in sowing on account of the wet weather conditions.

4. *Cotton grown as a mixed crop versus cotton grown pure.*—In this experiment two rows alternated with one row of the crop grown as a mixture. The results of the 1913–14 crop are given in Table II of the appendix. From the results of observations made in the field, this method of mixing hardly seems a fair comparison; for when the mixture is harvested there are only two-thirds the number of cotton plants compared to the full stand where cotton has been grown pure. This would not be a serious objection in a normal season, since the cotton

would have ample opportunity to grow and fill up the vacant space, but the last two seasons have been abnormal, sowings have been late and the cotton has never had time to develop fully before bolls commence to form. This is borne out by the relatively high yield of the summer pickings in the case of the crops sown with mixtures. A comparison of the yields of cotton obtained from plots sown mixed with different subsidiary crops clearly show, however, that coriander very much reduces the acre yield of cotton. This has been indirectly brought to the notice of many ryots by the conditions under which the departmental seed farms are grown. One of these conditions is that the cotton should be sown without any mixture. This has meant that the contract growers have had to set aside small areas where coriander, bengal gram and horse gram have been grown for their own requirements. In many cases, it has been observed that this practice has been continued as the ryots have found that it pays them much better to do so. From this year forward instead of reserving one row in three for the subsidiary crop this has been sown mixed with cotton so that after the former has been harvested a full stand of cotton is left in the field.

5. *Cotton spacing experiments.*—The results of these experiments for the last five years will be found in Table III of the appendix. In this table is also shown a summary of the seasonal rainfall for each year. Considering the yields of the last five years, the general results are in favour of the closer planting. There are, however, various conditions in the conduct of these experiments which are not under control, the most important of which is the time of sowing. This coupled with the distribution of the rainfall has a very great deal to do with the yield.

The following conclusions have been drawn from these experiments and from observations made as to the effect of the season on the crop yield:—Chart No. 1 shows the difference caused in the ripening of cotton according to the space between the plants in the row. This clearly demonstrates that close planting hastens maturity and the question which the farmer has to decide is whether he wishes to hasten maturity or not. This decision depends entirely on the time of sowing and the distribution of the rainfall, and as the latter is complete, except in very abnormal seasons, before thinning is completed, the farmer has this in his control. If the season is early and the rainfall light as was the case in 1910–11, early maturity is desirable. There is only a limited quantity of moisture in the soil and the crop has been able to develop a deep root system. It is essential therefore to get the crop in before this moisture is used up.

If sowing is early and the subsequent rains are heavy and continue into December, then spacing should be much wider. The late rains tend to check deep root development and if the planting is close, the crop will tend to come to maturity early. Between December and the time of ripening there is no rain, the weather is all the time becoming warmer and transpiration is more rapid. Thus not only is the surface soil rapidly drying out by evaporation but the crop is making heavy demands on the soil moisture. Early maturity means that the crop requires more moisture just at a time when it can be least spared. The root system has to try and maintain a luxuriant

vegetative and reproductive growth when it should be employed in going deeper and seeking moisture from greater depths. The result is that the plant cannot maintain the rate of development, which its surface root system encouraged on the advent of fine weather and has to dispense with what it can in order to keep alive. The first thing to go are the large axillary leaves, then immature flower buds and finally young bolls. If however wider spacing is given the plants are not encouraged to mature and the root system has an opportunity of getting down deeper into the soil before it commences its reproductive growth. This means a later but more drought resistant crop.

If the sowing is late and the seasonal rains are scanty, then close planting should be adopted The root system will naturally be a deep one and as maturity depends on the supply of moisture in the soil lasting out, it should be made as early as possible.

If the sowing is late and the seasonal rains have been heavy, the conditions are much the same as if sowing were done in the normal time in a normal season. Such late sown crops are quite young when the soil conditions are wet and as the dry weather commences shortly after sowing, the root development will be normal and the crop can withstand considerable dry weather conditions. In this case early maturity is required so that picking can commence before the hot weather really sets in and the closer planting should be adopted. The figures of 1912–13 and 1913–14, in both of which years these experimental plots were not sown until well into November, bear out this reasoning. That in both cases there was abundance of moisture deep down in the soil is shown by the heavy summer pickings. These conclusions are drawn from cotton soil under ordinary conditions of farming and do not apply to land which has been heavily manured.

6. *The residual value of manures on black cotton soil.*—This experiment, as mentioned in the report of 1912–13, was originally designed to test the relative values of cattle manure prepared or preserved in different ways. Manures were applied for eight years, *i.e.*, through two full rotations, *i.e.*, first year fodder sorghum, second year cotton, third year cumbu (Pennesetum typhoideum) and fourth year cotton. After the eighth year the application of the manures was stopped and the residual values are now being recorded. The yields obtained, which are shown in table IV of the appendix, bring out very clearly the remarkable value of cattle manure. In 1912–13, when these plots were cropped with fodder sorghum, the yields obtained were considerably higher than those of the two years when these plots were manured and cropped with fodder sorghum—this in spite of the fact that the yield of the "no manure" plot was in 1912–13, 30 per cent. less than the average yield obtained in previous years. The increase over the previous average yield was 20 per cent. in the case of loose box manure, 22 per cent. in the case of pit manure and 11 per cent. in the case of heap manure. In the case of cotton in 1913–14 the yields of kappas obtained were also very much in advance of the previous yields of cotton after fodder sorghum. It may, however, be said that the season was exceptionally favourable as the "no manure" plot yielded 60 per cent. or 256 lb. more than the previous average yield. But even deducting this 256 lb. from the yields obtained from the cattle manure plots, the yields are in each case within 16 lb. of the previous

average when manure was annually applied. Even in the case where cattle manure, preserved by the local method (this was only applied for three successive years) was applied, the yield after deducting 256 lb. was only 82 lb. less than that obtained when the manure was applied. The yields for cumbu in 1914–15 are low. For this, however, the season was mainly responsible as even the "no manure" plot shows a reduction of 27 per cent. when compared with the previous average grain yield and 19 per cent. when compared with the previous straw yield. Allowing for this reduction, due to the season, the yields of grain obtained show a reduced yield of 22 per cent. in the case of loose box manure, 24 per cent. in the case of pit manure and only 15 per cent. in the case of heap manure against the average grain yield previously obtained when the plots were manured. The reduction in straw yield is, however, much greater being 55 per cent. in the case of box manure, 52 per cent. in the case of pit manure and 40 per cent. in the case of heap manure. In the 1912–13 report it was pointed out that the residual effects of cattle manure in the case of shallow rooted cereals were more marked where the method of conserving cattle manure retained the most organic matter and that the yields of fodder sorghum closely followed this, being higher as the proportion of organic matter in the manure increased. In spite of the fact that this is the third year since manuring ceased, the yields of cumbu obtained this year still appear to be influenced by this as the following figures show :—

——	Percentage of organic matter.	Yield of fodder sorghum 1912–13.	The proportion of cumbu in 1914–15 to fodder sorghum is as	
			Grain.	Straw.
Loose box manure ...	56·80	5,263	1 : 10·7	1 : 4·51
Pit manure	45·01	5,194	1 : 11	1 : 4·55
Heap manure ...	38·87	4,232	1 : 11·7	1 : 5·03

Turning next to the money value of these cattle manure residues, it will be seen that the annual average value for the last three years is almost as high as in the years when the manures were applied. The following figures show the value up-to-date of these manures as shown by crop yields.

	Average quantity applied per acre for eight years.			The total increase in value over the no manure plot.			Value of manure per ton as shown by crop yields including those grown with the help of manurial residue.		
	TONS.	CWT.	QRS.	RS.	A.	P.	RS.	A.	P.
Box manure ...	4	11	3	251	6	2	6	13	7
Pit manure ...	4	17	2	222	4	0	5	11	2
Heap manure ...	5	15	2	238	2	9	5	2	5

These figures include the value of manure residues only for three years and this year's yields show that these are by no means exhausted. The quantity of manure applied per acre is that voided by two pair of cattle and the difference in weight applied is due to the method by which it is collected. The heap manure which is merely a heap in the open is exposed to all winds that blow and must accumulate large quantities of foreign insoluble matter. The pit manure is conserved in a masonry pit which is covered with a thatched roof, hence its weight approximates closely that of the loose box manure. The total value of crop produced is the index to the value of the manure rather than the value per ton and it will be seen that there is very little difference in the value of any particular method when the manure is applied to rainfed crops grown on black cotton soil. It is slightly in favour of the loose box system, but only a matter of Rs. 13–3–5 spread over a period of 11 years, *i.e.*, Rs. 1–3–3 per annum when compared with the method almost universally adopted in the Presidency. The local method in this tract of preserving manure is a good one, viz., of placing the manure in a pit, periodically moistening this and covering with tank silt. Although this method was only included in the experiment for the last three years both the yields obtained in the years of application and the residual values seem to show that this is even better than the loose box system. These remarks cannot be taken as generally applicable, but apply to black cotton soils where rains seldom fail in the growing season. It is probable that these values would be very different under garden cultivation for example, and judging by the way that cereals respond to organic matter, the box manure would probably show a much greater superiority.

The residual value of concentrated manures is very small when compared to that of cattle manure. There was a very appreciable reduction in the first year especially in the case of superphosphate and saltpetre when the yield was little more than half the previous average. It was mentioned, however, in the 1912–13 report that in all probability these soluble manures had worked down into the soil and that their presence, especially that of superphosphate and saltpetre, would be indicated in the following year when cotton—a deep rooted crop—was grown and this has proved to be the case. This is further shown by the yields of cambu, a shallow rooted cereal in 1914–15 which is little better than that of the no manure crop.

Comparing the residual value of neem cake and superphosphate and saltpetre, the former has given slightly higher yields in 1912–13 and 1914–15 when shallow rooted cereals were grown, but the yield of cotton in 1913–14 shows that this had not worked down into the soil like the more soluble chemical manures.

These conclusions are corroborated by chart No. 2 which shows how these manures effect the ripening of cotton. The curve in the three cattle manure plots is practically the same in each case and indicate that these less soluble manures have remained nearer the surface and therefore have checked the downward development of the root system and thus hastened maturity. The curve for the soluble chemical manures is practically the same as that of the no manure plot showing that these have worked deeply into the soil.

7. These ripening curves as well as those obtained from the spacing experiments indicate that it is possible to some extent to control the period when the cotton crop ripens and this is of great importance in a tract such as this where the weather conditions at the time of crop's maturing play such an important part in influencing the crop yield. It is more than probable that insufficient attention has been paid in the past to this question of root development, especially when the character of the black cotton soil is considered. It is never possible to forecast with any degree of accuracy what the cotton crop in this tract is going to produce. Shedding of young buds, flowers and young bolls occurs every season with varying severity and very often this shedding may be quite local. Shedding always follows a light rain. At first thought one might consider that such a rain might affect the setting of the flowers, but on examination it is found that the sheddings are mainly immature flower buds. The effect of light rains is to moisten the surface soil, which not only swells and closes cracks at the surface, but as soon as the sun comes out it forms a surface crust. This must affect the aeration of the root system and check the normal root action very considerably with the result that this cannot maintain the whole of the prospective crop. Again a heavy shower when the crop is in full bursting always has the effect of immediately stopping further bursting of bolls for some few days which again seems to point to an interruption of the normal root action.

8. The work of improving the local cotton by selection has been continued on the lines previously adopted. One further unit strain has been distributed this year and is giving good results while another one is being grown on seed farms for distribution next year. This is a promising variety, but the season has been against it.

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APPENDIX.

The Koilpatti Agricultural station consists of two blocks, one on the black cotton soil and the other on the red soil, a coarse gritty loam consisting of decomposed gneiss and quartzite. Each of these blocks is meant to represent a distinct agricultural tract with different seasons, crops and agricultural practices.

1. *The black cotton soil tract.*—The black cotton soil of the Tinnevelly district varies considerably both in depth and colour. The best quality is known as "karisal" (black soil) and is represented on the agricultural station. On the farm this varies in depth from about 5 to 7 feet and rests on a bed of canker or nodular limestone which in its turn rests on a rotten garnetiferous gneiss. Small nodules of canker and some garnetiferous sand are found in the soil itself. Other inferior black cotton soils are represented in the tract such as "Veppal," a grey coloured soil, which is shallower, and contains much more canker and "pottal," which is a shallow slightly alkaline soil.

2. *Rainfall and seasons.*—The total rainfall of the district is fairly typical of the cotton growing tracts. The sowing season commences with the setting in of the north-east monsoon, i.e., the end of September to October. It is later in the south and earlier in the north of the district. The average rainfall from October to December for the whole district is 16·34 inches. This gradually diminishes in December, and January to March are usually dry with occasionally a heavy rain, the average for these three months being 3·35 inches, though in the cotton tracts it is only about 2·50. During this time south-easterly breezes are usually experienced which materially assist in ripening the cotton and in bursting the bolls. In the north of the district cotton picking may commence in January though more often in February, and lasts for about one month. In the south with its later sowing, it seldom commences before March and as Karunganni is the predominating variety here, picking may last from two to five months according to the April and May rainfall. In these two months heavy showers or summer rains are usual, which give the cotton a second flush or summer picking. The average fall of these summer rains is 3·58 though this varies from season to season. Occasionally they fail altogether, while in other years they are often 5 to 6 inches; in the year 1907–08, 11·25 inches were recorded in the agricultural station. Light showers or heavy mist at this time are most unwelcome as they cause buds and young bolls to shed. From June to September occasional light showers occur averaging 3·53 inches, which are usually only utilised for ploughing the land in preparation for the sowing season.

3 *Rotations and crops.*—The common rotation is cotton one year and cumbu (*Pennisetum typhoides*), the principal food grain of this tract, the next, with an occasional crop of "chola pattu" or fodder cholam (*Andropogon sorghum, Irungu var*) in place of the cumbu. This rotation, of course, varies with each cultivator. Poorer ryots often grow cotton year after year on the same land, while richer ryots either increase the cereal, or in some cases grow a three-course rotation of cotton, cumbu

and Bengal gram (*Cicer arietinum*); pulses such as cowgram (*Vignacatjang*) and mochai (*Dolichos lablab*) are usually mixed with the cumbu, but there is really no suitable pulse crop for the black soil in the district. Many rich ryots pride themselves on their "Cumbu-adi," *i.e.*, land cropped year after year with cumbu. Such lands receive an undue proportion of manure and are usually very rich, too rich in fact for cotton which tends to run to leaf if grown. If a sowing rain chances to occur in August, red gram (*Cajanus indicus*) is occasionally sown as a pure crop, but with this exception all the other crops are sown with the north-east monsoon rains. Fodder cholam is usually sown first in the season and then cumbu mixed with pulses. After this is completed cotton is sown. Occasionally even the season for cotton is lost and then Bengal gram (*Cicer arietinum*) or horse-gram has to take its place. The seed rate for fodder cholam is very high 120 to 150 lb. of seed per acre against 10 to 25 lb. the ordinary seed rate for fodder sorghum in other countries. As a consequence the crop seldom grows more than three feet high, but gives a very fine leafy straw and excellent fodder. This is usually bundled and stacked with the cumbu straw, thus giving a fairly good composite fodder for the dry months or for times when the cattle are at hard work. This cholam cannot in any way be considered as a grain crop as the seed obtained is seldom more than sufficient for sowing during the next season. Cotton being the most important crop of the black soil, it is with this that most of the experimental and demonstrational work on the Agricultural station has been done and it is necessary that a more detailed account of the Tinnevelly cottons should be given. Of this there are two varieties found in the district, usually sown mixed together, viz., Uppam (*Gossypium herbaceum*) and Karunganni (*Gossypium obtusifolium*). Of recent years a very inferior cotton known as pulichai or malan cotton—the Jari of the United Provinces, has managed to establish itself on account of its high ginning outturn. The Karunganni is generally supposed to be the original "Tinnie" cotton of commerce. Old men will tell one that this was the only variety grown when they were young. The "Tinnies" of today consists of a mixture of the two varieties, though that of the north contains as much as 70 to 95 per cent. of Uppam and that of the south is sometimes pure Karunganni. Quantities of cotton are also brought in from the adjoining district of Madura as well as from Coimbatore and Trichinopoly which are classed as Tinnies. The value of cotton exported in 1912–13 from Tuticorin was Rs. 203 lakhs out of a total of Rs. 407 lakhs for the whole of the Presidency, *i.e.*, about 50 per cent. Of this Rs. 125 lakhs went to Japan, Rs. 30 lakhs to the United Kingdom, Rs. 49 lakhs to Germany and Rs. 3·7 lakhs to Belgium. "Tinnies" on the Liverpool market is usually valued second or sometimes highest of the Indian cottons and when one compares the pure lint of each of the two varieties, it is difficult to understand why such a high price is paid for a mixed lint. Uppam has a short, harsh, but very white staple, while the Karunganni is much finer, longer, and stronger and of a pale cream colour. As regards the plant itself, the Uppam is a pure black cotton soil variety and is of a tall straight habit with short "boll bearing" branches. It comes to maturity a little later than the Karunganni, but as the picking lasts for only one month it will often give a crop when the Karunganni would fail. The bolls open well and the kappas hold together and is easy to pick. The ordinary type of the Karunganni plant on the other hand branches freely and forms a smaller more bushy plant. The bolls begin to burst earlier than the Uppam, but do not ripen all at one time. The picking lasts much longer—and probably for this reason the plant can, if rain occurs, recover more easily than the Uppam and gives therefore a much

heavier "Summer" picking. The Karunganni is not a pure black cotton soil variety, but will often give fair crops on red soil. Cotton is very seldom grown mixed with cereals. Very occasionally one sees a thin sowing of tenai (*Setaria italica*) but this is rare. In the south of the cotton tract, coriander is often sown broadcast with cotton and of recent years owing to the high price of the commodity its cultivation has extended northward and it has become a much more prominent subsidiary crop. Throughout the tract either horsegram (*Dolichos biflorus*) cowgram (*Vignacatjang*) or Bengal gram (*Cicer arietinum*) are sown behind the plough in furrows about 8 feet apart. In a few places one also sees castor and pulichai (*Hibiscus cannabinus*) sparsely sown with cotton either broadcast or in plough furrows.

4. *Manuring and soil improvement.*—During the dry months the ryot's time is employed in carting silt from the beds of rainfed tanks on to his lands. Thus red sandy silt is usually carted on to black cotton soil and black silt on to red soil. This soil mixing is carried on to such an extent, that when freshly ploughed, it is often possible to distinguish separate field by the colour of the newly turned soil. The usual method of manuring is that of folding sheep on to the land. The ryots of a village usually join together and keep a common flock which are folded on to each man's land in turn. One thousand sheep for one night is considered sufficient for one acre. Manuring with cattle dung is also practised and is chiefly applied to the cumbu crop; though, if the cultivator possesses land under wells, he is inclined to apply the manure here by preference. Good cultivators take great care to preserve the dung heaps properly. Each man has his own pit in the village, in which cattle droppings and refuse from the house and fields are put. A heap of tank silt is often seen near the manure pit and some of this is, from time to time, thrown over the surface of the manure. Even when manure is carted on to the fields, it is often neatly heaped in one large heap and covered over with soil or silt until the time comes for it to be ploughed in.

5. *Cultivation.*—Unlike the practice in many black cotton soil tracts of India, the ryot as soon as the crop is harvested, takes advantage of the first ploughing rain to plough his lands. This practice is probably the result of experience; the black soil of the district, being shallow, cannot crack to such an extent as deep black soil would. Thus land cropped with cumbu has often received its first ploughing before the cotton picking has commenced; that under cholum is usually ploughed up in April and May and that under cotton after the cotton stalks have been pulled up which may be any time from June to September. On the black soil the only bullock power implement is the country plough and seed of the main crop is always sown broadcast and ploughed in, though secondary crops such as cowgram and mochai are usually sown in lines, the seed being dropped behind the plough. After cultivation in the case of the cereals consists of ploughing through the crop. This is seldom done with the cotton which is hand-hoed three times instead. Of recent years the seed drill and implement for inter-cultivation have been introduced by the department and their use is becoming common.

6. *Red soil tract.*—This covers a large area of the district and is usually found on slightly raised elevations as if the black soil had filled up the shallow valleys between. It is a coarse gritty soil full of angular fragments of quartzite. It sets hard when dry and very easily cakes on the surface after rain. The seasons are not so well defined as on the black soil and crops are usually sown either with the summer rains of April and May or with the showers of the south-west monsoon from June

to September. On unirrigated land only the hardiest of cereal crops such as varagu (*Paspalum scrobiculatum*), samai (*Panicum miliare*), kudiraivali (*Panicum frumentaceum*), cumbu and cholam are grown, while pulses always form a prominent part of the mixture. These include (*Vigna-catjang*, *Phaseolus radiatus*, *Phaseolus mungo*, *Phaseolus aconitifolius*, *Dolichos lablab*, *Dolichos biflorus*). On the very poorest land only samai (*Panicum miliare*) and horse gram (*Dolichos biflorus*) and occasionally senna (*Cassia senna*) are grown and these only as pure crops. Karunganni cotton is sometimes grown as a north-east monsoon crop; and in certain confined tracts where the south-west monsoon comes through gaps in the ghauts, groundnuts have, of recent years, been introduced. As can be expected the ryots do not as a rule depend entirely on these lands. Their object is to possess a well and to improve the land by carting on to it tank silt in very large quantities and by very heavy manuring. Many of such garden lands though lying entirely within an area of red soil are now dark rich loams. Here valuable garden crops are grown such as tobacco, onions, sweet potatoes, chillies and brinjals and within the recent years Cambodia cotton. This has now become a regular rotation crop, especially on land where the water supply may prove to be scarce. These are grown in rotation with cereals while occasionally a catch crop between seasons of Kadaikanni (*Pannicum miliaceum*) a six-week crop is taken. Of the cereals ragi (*Eleusinecora cana*) is perhaps the commonest cereal and can be grown both in the monsoon and in the hot weather season. Cumbu and cholam are grown only as hot weather crops. Of the other crops tobacco, chillies, brinjals, and sweet potatoes are grown as monsoon crops, while onions are grown in both seasons. The usual mixture of gourds, pumpkins, spices and curry-stuffs are also seen.

7. *Dry cultivation.*—The ground is ploughed when a ploughing rain falls and seed is sown broadcast and ploughed in. Red gram and *Dolichos lablab*, if sown, are put in lines by dropping the seed behind the plough. Occasionally, if rain occurs when the crop is young, an implement resembling a large wooden rake, drawn by a pair of bullocks, is used to break the crust on the surface. When the crop is well established it is ploughed through and left to ripen.

8. *Garden cultivation.*—The cultivation of garden lands is much more intense, after manuring and ploughing the land is laid out into small square beds with necessary supply channels and the whole surface is flooded. Into this the seedlings, cuttings or sets, as the case may be, raised previously in a nursery are planted. Kadaikanni (*Pannicum milaceum*) is the only crop which is sown in situ and this is sown before flooding. This transplanting of all cereals in garden lands is peculiar to this district. The after-treatment consists in hoeing, weeding and irrigating. Tobacco receives the special treatment usually given to this crop such as topping, and suckering as well as a top dressing of the salt earth which is collected in certain villages at the base of walls and houses. The tobacco is always sold by weight and is used only for chewing, so ryots prefer the plants with the coarsest leaves and thickest ribs.

TABLE I.

Rainfall Statement.

Month.		Average for six years 1908–09 to 1913–14.				1914–15.			
		Red soil.		Black soil.		Red soil.		Black soil.	
		Inches.	Number of rainy days.	Inches.	Number of rainy days.	Inches.	Number of rainy days.	Inches.	Number of rainy days.
April ...	First half	1·42	2·00	1·38	1·66	3·28	4	2·87	3
	Second half	1·59	3·66	1·66	5·33	...	0	0·90	2
May ...	First half	2·13	3·00	2·14	3·16	2·20	2	1·77	1
	Second half	0·91	2·33	0·91	2·16	0·87	1	0·19	1
June ...	First half	0·42	0·33	0·38	0·83	...	0	...	...
	Second half	0·59	1·00	0·41	1·33	...	0	...	...
July ...	First half	0·13	1·00	0·20	1·00	...	0	...	...
	Second half	0·69	1·00	0·39	1·16	...	0	...	...
August ...	First half	0·91	0·50	0·11	0·50	1·79	2	1·29	2
	Second half	0·66	3·00	1·50	2·50	...	0	...	...
September ...	First half	2·34	3·00	2·01	2·33	1·87	3	1·15	4
	Second half	0·88	2·00	0·73	2·00	1·79	3	1·52	3
October ...	First half	3·08	4·66	3·18	4·83	9·65	11	9·27	11
	Second half	6·17	8·00	6·68	7·50	4·87	11	4·32	[illegible]
November ...	First half	2·03	5·83	2·23	5·50	2·27	6	[illegible]	7
	Second half	3·41	5·16	3·61	5·16	...	0	[illegible]	[illegible]
December ...	First half	0·61	2·50	0·65	2·50	6·84	7	7·03	7
	Second half	0·65	1·66	0·60	1·50	2·50	3	2·69	3
January ...	First half	0·42	1·50	0·53	1·50	...	0	...	...
	Second half	0·09	1·00	0·11	1·00	0·13	1	0·11	1
February ...	First half	0·06	0·50	0·04	0·33	0·08	1	0·02	1
	Second half	0·35	0·66	0·31	0·66	0·85	1	1·38	1
March ...	First half	0·21	0·33	0·06	0·16	...	0	...	...
	Second half	0·12	0·83	0·01	0·66	0·10	1	0·30	1
	Total ...	29·87	55·45	29·86	52·76	37·59	57	26·91	59

TABLE IV.

Statement of the average crop yields and their values in the experiment to determine the value of cattle and other manures.

—	Fodder-sorghum. Dry fodder in pound per acre.	Cotton following fodder-sorghum. Kappas in pound per acre.	Cumbu in pound per acre.		Cotton following cumbu. Kappas in pound per acre.	Annual average value of the manure as shown by crop yields.	Residual value of manure applied.							
			Grain.	Straw.			Fodder-sorghum. Dry fodder in pound per acre.	Residual value of manure as shown in first year.	Cotton following fodder-sorghum. Kappas in pound per acre.	Residual value of manure. as shown in second year.	Cumbu in pound per acre. Grain.	Cumbu in pound per acre. Straw.	Residual value of crop as shown in third year.	Total residual value of three years' crops.	Average annual residual value.
						Rs. A. P.		Rs. A. P.		Rs. A. P.			Rs. A. P.	Rs. A. P.	Rs. A. P.
Box manure, 9,798 lb. ...	4,365	686	623	2,416	807	23 3 0	5,263	29 5 7	† 954	27 4 10	† 428	† 968	9 3 9	65 14 2	21 15 5
Pit manure, 10,934 lb. ...	4,229	632	605	2,160	807	20 12 6	5,194	28 10 7	872	19 1 7	354	930	8 3 10	56 0 0	18 10 8
Heap manure, 12,848 lb.	3,801	756	514	1,580	855	18 8 1	4,252	19 0 8	† 1,092	32 1 7	† 360	† 640	6 15 10	52 2 1	19 6 0
Neem cake, 1,000 lb. ...	4,442	637	642	2,309	968	18 7 10	3,713	13 13 7	743	6 8 0	268	718	2 15 9	23 5 4	7 12 5
Super-phosphate, 261 lb. and Salt-petre, 300 lb.	6,168	142	617	2,136	787	27 2 11	3,182	8 5 5	829	14 12 10	341	576	1 13 11	25 0 2	8 5 5
Cattle manure—local method, 21,483	* ...	713	462	1,123	859	17 7 1	3,920	15 14 8	887	20 9 7	348	744	6 1 9	42 10 1	14 3 4
No manure	3,328	425	260	595	460	...	2,328	...	681	...	204	452	...	...	...

* This was only applied in the last three years of the experiment.
† Only one plot was used for these figures as the duplicates had been badly scoured by a heavy wash.

Basis of money value:—

Kappas	lb. 10	per Re. 1.
Fodder cholam	100	
Cumbu grain	30	
Do. straw	200	