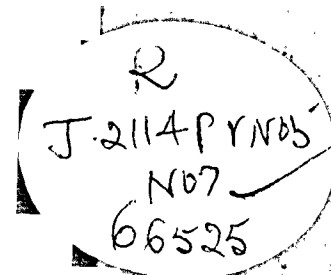
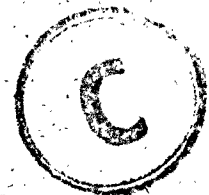


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1905-1906.



Department of Agriculture, Madras.



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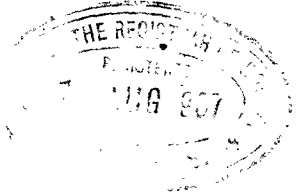
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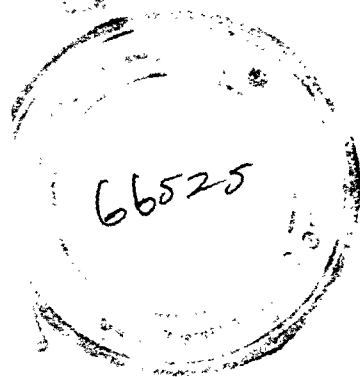
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SCIENTIFIC REPORT OF THE PALUR AGRICULTURAL STATION.

THE South Arcot Groundnut and Sugarcane Farm was founded with well defined objects. It was to be devoted to the general study of the groundnut industry, including the collection of new varieties, the examination of the local methods of cultivation and, especially, the diseases affecting the crop. It was also intended as a nursery from which the improved kinds of sugarcane raised at the Samalkota farm might be distributed to the southern parts of the Presidency and it was proposed, at the same time, to devote some attention to the local cane industry and to replace the inferior kinds prevailing in the district. A subsidiary study was indicated, if time permitted, of the indigo crop, once a very important feature of the local agriculture.

After a prolonged tour through the district, sixteen acres were rented in 1905 in the village of Pallavarayanatham near Palur, close to the north bank of the Gadilam river, about nine miles by road from Cuddalore, the district head-quarters, seven miles from Panruti, the centre of the groundnut area, and five miles from the South Indian Railway at Nellikuppam, where Messrs. Parry & Co.'s sugar-mill is situated in the chief sugarcane area. The farm included about 11 acres of dry land and five of wet. It was rented for two years in order to determine whether the site was suitable. At the end of the first year, however, the results being considered satisfactory and money being available, it was decided to greatly extend the farm and make it permanent, and 32 acres of dry land and 20 of wet have therefore been acquired.

2. The farm is situated on the alluvial tract between the Ponnai and Gadilam rivers. The soil is a sandy loam without stones and generally capable of being reduced to a very fine tilth. There is sufficient clay in the dry lands for them to form a hard cake after rains and in the wet for them to be worked by the crowbar into large blocks. The depth of soil has not been definitely determined, but an inspection of the wells shows that it is underlain by sandy layers providing excellent natural drainage and well supplied with subsoil water.

The soil on the farm has been analysed by the Imperial Agricultural Chemist, two samples being sent from the wet and four from the dry land. His report is as follows:—"This land is well supplied with mineral plant food and should prove very fertile, if manured with ordinary farm manures. The amount of lime is not large, but I believe it to be sufficient." The details are given in the appended table.

Composition of six samples of soil from the Palur Groundnut and Sugarcane Farm.

	Dry area.				Wet area.	
Total nitrogen ..	·042	·051	·046	·054	·051	·063
Available phosphoric acid.	·028	·028	·023	·027	·013	·020
Available potash.	·011	·012	·012	·011	·007	·009
Calcium carbonate.	·167	·227	·179	·136	·091	·136
	Average of dry area.				Average of wet area.	
Insoluble silicates and sand ..	..	..	..	90·68	86·23	
Iron oxide ..	..	..	..	2·47	3·28	
Alumina ..	..	..	..	3·72	5·67	
Lime ..	..	..	..	·63	·64	
Magnesia ..	..	..	..	·34	·53	
Potash ..	..	..	..	·19	·14	
Soda ..	..	..	..	·05	·09	
Phosphoric acid ..	..	..	..	·04	·03	
Organic matter and combined water ..	..	..	..	1·88	3·39	
	100·00				100·00	

The wet land is irrigated by the fourth channel from the Tiruvadi anicut of the Gadilam river. The supply is perennial, but there is scarcity at times, the channel being dependent on springs in the bed of the river. The dry land is supplied by nine wells. Several of these are not in working order, but they can be easily repaired and should then be capable of supplying as many acres as are required for irrigated crops at all times of the year. There is an abundant supply of sub-soil water at no great depth. The rest of the farm is dependent on the rainfall which, as will be seen from what follows, although generally good during the months from August to December, is liable to extraordinary fluctuations. This fact renders the working of the farm difficult. No definite scheme of planting can be laid down, for the kind of dry crop sown in the latter half of the year depends primarily on the date of incidence of rains suitable for ploughing the land, applying the manure and sowing the seed. The general character of the rainfall of the farm and the district will be considered under "Groundnut" as this crop is mainly dependent on it, while the sources of irrigation will be dealt with under "Sugarcane."

An objection that has been urged against the site is its liability to floods. The matter has received very careful attention. At certain intervals (according to some, every ten years) the whole country between the Ponnar and Gadilam rivers is submerged for several hours or, more rarely, days, the flood water quickly running off. I find that the same is the case all up the Ponnar river, as far as Tirukkóyilúr, and in fact that the conditions there are distinctly worse. Somewhat of a record flood occurred in December 1903 and we were thus able from

local enquiries to judge of its severity in the neighbourhood of the farm. It appears that the limited site at first rented is free from flood water, and it was chosen for that reason. It is protected by a high bund along which the road to Pallavarayanattam runs and a branch of this road passing to the south of the farm between it and the river. It is proposed to continue the road right round the farm and steps are being taken to do so. For the rest, the farm lands are fairly high and no great damage from floods is anticipated.

3. The chief work on the farm thus far has been the laying out and enclosing of the land and its preliminary study. It is the custom of the district to dig out certain fields of dry land with great labour and by this means to lower their level sufficiently for the irrigation water to flow over them. Thus the dry land is converted into wet, and thus it is that such dissimilar crops as sugarcane and groundnut requiring wet and dry land, respectively, can be obtained within the same enclosure.

As the wet land in the district suited for sugarcane cultivation is comparatively limited, the determining factor in the selection of the farm site was the presence of suitably irrigated sugarcane land. The huge heaps or hills of spoil dug out from the dry lands in its formation render the division into plots and blocks a difficult and laborious piece of work, but this spoil will be largely removed in the construction of the raised road round the farm already referred to. Naturally, not much has been accomplished thus far in scientific agriculture, and it is not proposed to publish the results of crop experiments, etc., until they can be considered authoritative. The first duty of the farm officers has been to study the local methods, get acquainted with the land and seasons and to grow the local crops. Collections have been made from all sources of varieties of sugarcane, groundnut and indigo and these have been grown on the farm. Distribution has commenced already of groundnut and sugarcane, especially the latter, the quantity on the farm being insufficient to meet the local demands. These subjects will be dealt with in detail below.

It will be well, however, in the first place to give a brief account of the present position of the local groundnut and sugarcane industries, as this enquiry has formed the most important work of the farm thus far, and, by this survey, the object of founding the farm and the lines of work which have been thus far suggested will be more readily understood. The latter, while affording abundance of useful work, are by no means final, for it is obvious that as our knowledge of the conditions of the district increases and we devote more study to the way in which groundnut and sugarcane are grown both here and in other parts of the world, the experiments will be extended and modified in various directions. The following statements are compiled from notes taken during several tours made through the district, in anticipation of the founding of the farm.

4. The gradual rise of the *Groundnut Industry* in South Arcot is traced in Bulletin No. 28 of the Madras Agricultural Department. This deals with the period up to 1892. While the first mention of this crop in India appears to be in Buchanan's "Travels in Mysore, etc." written in 1800, we learn from a report of the Collector of South Arcot

that in 1850 there were 3,000 acres in the neighbourhood of Panruti and another 1,000 in the Villupuram taluk, and that it was considered to be a profitable crop. From that time onwards, the area under groundnut increased rapidly, until in 1889-92 the average was 150,000 acres.

In 1896-97 there was a sudden sharp decline to below 100,000 acres, the lowest point being reached in 1897-98, when the area was 52,000 acres. This drop has never been satisfactorily explained, a similar decrease in area having been noted at the same time in Bombay, the only other Presidency where groundnut was grown to any considerable extent. The decline is dealt with in Bulletin No. 37 (1899) and a number of opinions are quoted as to its cause, chiefly, however, by people unacquainted with the local conditions. The ryots' opinion appears to have been strongly expressed that the seed itself was at fault. The plants had decreased in vigour and become liable to many pests and the oil in the nuts had decreased in quality and quantity.

An enquiry was instituted in 1899 to see if it would be possible to infuse life into the decaying industry by introduction of new seed by Government, but it was then found, as detailed in Bulletin No. 38 (1900) that this change of seed had already occurred, at any rate in the neighbourhood of Panruti and that the local, "native" kind had been completely replaced by a new so-called "Mauritius" variety. There was no doubt as to the superiority of the new seed and it rapidly spread over the district, until it became difficult to obtain samples of the old kind. From that time forward the acreage again increased and moreover reached dimensions far beyond anything dreamt of before. These facts are clearly indicated in the accompanying table:—

Acreage under Groundnut in South Arcot.

1850 .. About 4,000	1895-96 .. 142,000
1855 .. Over 8,000	1896-97 .. 88,000
1870 .. Over 20,000	1897-98 .. 52,000
1882 .. Over 48,000	1898-99 .. 71,000
1885 .. About 100,000	1899-1900 .. 133,000
1889-92.. Average 150,000	1900-1901 .. 208,000
1901-1906 .. Average over 300,000 acres.	

Up to 1897-98 South Arcot accounted for 60 per cent. of the acreage under groundnut in the Presidency. During the depression of 1897-98, this percentage fell to 50, showing that, whatever the causes were, they were most keenly felt in this district. After the revival, on the other hand, the percentage rose to 70 and even 75 showing that South Arcot is peculiarly suited to groundnut cultivation and export. It has always played the leading part in the industry, not only in the Madras Presidency but in the whole of India.

5. The crop is now grown over nearly one-fifth of the district, thus easily taking second place to paddy. The following figures are taken from the recently issued District Manual, it being noted that the year in which the details are given marked the highest point reached hitherto by the groundnut:—

Crops in 1902-1903 in South Arcot.
Paddy (*Oryza sativa*, Linn.) 492,000 acres.

Groundnut (*Arachis hypogaea*, Linn.) 324,000.
Cumbu (*Pennisetum typhoides*, Rich.) 227,000.
Varagu (*Paspalum scrobiculatum*, Linn.) 209,000.
Ragi (*Eleusine coracana*, Gaertn.) 114,000.
Gingelly (*Sesamum indicum*, D.C.) 66,000.
Total area cropped 1,644,000 acres.

The main facts regarding the earlier stages of the groundnut industry have been set out in great detail by C. K. Subba Rao in the bulletin already referred to as written in 1893. It must be noted, however, that very considerable changes have taken place in all directions since that time. Not only has the area under the crop greatly increased, but the seed has been entirely changed. The new variety has different soil requirements and, moreover, can be reaped in a shorter time, so that it has become possible for two crops to be reaped in one year. This latter fact alone has introduced profound changes in the agricultural practice.

Groundnut is grown chiefly on the light soils which abound in the district, both the fine red soils and the grey alluvia and loams being eminently suited to the crop. The various soils of the district are carefully tabulated and described in the 1893 bulletin. But, with the extension of cultivation and the profits arising from its growth, it has now been extended to almost all classes of land. It is not infrequently grown on wet land and is also found on high bare hills where formerly a scanty grain crop could only be obtained once in five years with intervening fallow. On the top of a low stony hill south of the Gadilam, within a mile of the farm, an annual crop is thus obtained; in fact, to quote the expressive, if somewhat hyperbolic, language of a native agriculturist, "Your honour, the people have even been known to grow this crop on the roofs of their houses."

Every one grows groundnut, and land which has proved itself capable of producing a profitable crop has increased twenty-fold in value. The price of labour, especially when most needed at crop time, has increased enormously and it is only by a liberal system of payment in kind that many of the fields are reaped at all. With poor crops, it is not infrequent for half the produce to be thus claimed, while in other cases the crop has had to be ploughed in, because of the refusal of the local labourers to reap it while other more prolific fields were to be dealt with in the neighbourhood.

With this state of affairs it is natural that good agricultural practice is frequently set at naught. Well known and approved systems of rotation are ignored. Continuous cropping on the same ground, especially by small holders, is frequent. It requires little prescience to foretell, not so far ahead, the appearance of some disastrous disease, or at any rate a great falling off in the yield obtained. There are signs of old diseases increasing as they did, before the old variety became unprofitable and several new ones have come into prominence during the last few years, while the general outcry is that the yield is less than formerly and the seed does not contain the same quantity of oil as it did on its first introduction. It will be one of the functions of the farm to determine whether these complaints are justified.

One of the chief lines of work in the newly started farm will, therefore, be to make a thorough study of this staple in all its aspects. In this way we shall be able, if not to prevent such rapid declines in the future, at any rate to mark their progress, to point out their causes and thus be in a better position to resuscitate this profitable industry with the least possible delay, whether by the counteraction of disease, improvement in cultivation or the introduction of fresh and more vigorous seed.

6. As far as can be traced from existing records, the year may be divided into two very definite seasons as regards rainfall. During the first six months, it consists of widely separated small showers. In July, these increase in number and frequency until in October a maximum is reached with the incidence of the north-east monsoon. This gradually dying away with good falls in November and December. Thus, taking averages of Panruti, Tirukkóyilúr and Cuddalore, we got 1-2 inches in January, none in March, 1-2 inches in each month from April to June, 3 in July, 4 in August, 7 in September, 12 in October, 8 in November and 7 in December. But one thing to be especially noted is that there are many irregularities in this rainfall. Thus in the two seasons we have passed through on the farm the weather has been very trying and "abnormal." Judged by totals the quantity precipitated has been fair, but it has come at very inopportune seasons.

In 1905, the first rain that fell was 2 inches on 16th-18th April. During the months, May to July, there were only 1.77 inches, falling in small showers. There were 7 inches in August but only 2 in September, 30 in October, 7 in November but 0 in December.

In 1906, with the exception of an abnormal fall of 4 inches on January 17, the total for the half year January-July was 2.13 inches. From July to the middle of September there were but 5 inches.

This irregularity in the rainfall has a very marked effect on the crops sown, *cumbu* (*Pennisetum typhoideum*) being preferred if early rains come in July or August, but the crop being changed month by month if the rains are withheld.

The division of the year into two well-marked seasons as regards rainfall has a marked influence upon the groundnut. There are two main crops in the district, the *irrigated* sown in January to March and the *rainfed* sown in July to September, the exact date depending on the occurrence of the rains. Each of these crops takes some six months to mature, and cases are not unknown where two good crops have been taken off the same land within the year.

The *irrigated* crop is naturally the less important, depending largely on wells for its water supply, although the yield is large and it is very profitable. It is usually sown pure or towards the end of a *ragi* crop between these plants. Neglecting wet land cultivation, which is not very extensive, irrigation is done by *picottahs*. In the neighbourhood of the farm and in several other parts of the district, the subsoil water is abundant and from the regular readings taken on the farm, is within easy reach even in the driest seasons. Owing, however, to the fact that most cultivators have themselves small areas under groundnut and *ragi* (*Eleusine coracana*), and that they will leave all outside work

to irrigate these small plots, there is frequently great scarcity of labour for working the *picottahs*. On the farm it has for this reason been found impossible on several occasions to work more than one well at a time and various crops under well irrigation have actually died out.

7. The *rainfed* crop is perhaps most frequently sown mixed with *cumbu* (*Pennisetum typhoideum*); *tenai* (*Setaria italica*) or some other grain. The exact crop and method depend upon the rains. If these are normal, the grain is sown first and the groundnuts are dibbled in at the second hoeing, but, when the rains are delayed or where labour is scarce, the two are frequently sown together, the groundnut being dropped in the plough furrows immediately after the grain has been sown. The rate of sowing is excessive as is the case in so many other crops in India, the *ryots* in the neighbourhood of the farm rarely consenting to put in less than 50 *marakkals* (about 135 lbs.) of seed per acre. This gives distances apart from five to nine inches for the plants.

Manure is always added, usually the ordinary "penta" or village sweepings. Where available, tank silt is spread on the land at intervals of several years, certain tanks enjoying great reputation and their silt being carted for many miles. Wherever ashes are to be had, they are eagerly sought for and the village earth which contains the most is most valued.

Without doubt the reaping of the nuts is most costly. The operation is well understood and the men and women employed for the various stages are expert in their work. The usual method is as follows:—After an irrigation or when the ground is moist, the plants are torn out and heaped on one side. The ground being thus cleared, several men working behind one another dig the earth up. This they do by *mamuti*, a local wet-land hoe, each stroke passing horizontally under the nuts at a depth of about four inches from the surface. The whole of the field is thus loosened and turned over and large crowds of women pick out the seed with their fingers. The same women pick off the nuts from the heaped up plants and they are paid according to the number of *marakkals* collected in the day. Measuring their heaps is done in a curious manner. The operator fills the measure with both hands, heaps it up and then finally collects as many nuts as his arms will hold. This method is obviously very rough, but it seems to meet with approval. The wages are either paid in kind or money and are not high. But the work is popular in well grown crops, for, during picking, many a nut finds its way into the picker's mouth. A second working over the cleared ground is not infrequent and the seeds collected this time belong to the gleaner. Pigs and jackals, dogs and crows root over the ground afterwards and find many a dainty morsel. As has been pointed out, it is difficult at times to get the necessary labour to harvest the crop, and if some simple modification of the potato digger could be introduced it would be a great gain. The want of some such contrivance is felt by the *ryot* and various expedients have been introduced. One is the "mamuti-plough" occasionally met with. Another is to plough up the land in the ordinary way. A third plan is to thoroughly swamp the land and plough it well in puddle when

all the ripe nuts, which float on the surface, collect in the lower corner of the field.

It is necessary to reap the crop punctually, for otherwise many of the seeds germinate. At the same time, there are usually a very large number of immature pods on the plants and these are entirely lost. The crops are for this reason reaped while the haulms are still green, and there is none of that dying down of the plants at harvest which we read of in other countries. Such is, in very brief outline, the usual custom regarding the cultivation of the groundnut. The nuts are sold direct from the field to agents who, by paying cash, obtain the seed at a very low figure. These again sell the produce to the merchants in the local centres. The nuts are decorticated by striking them with sticks. In certain parts, oil is extracted by the ordinary oil-mill, especially in the Villupuram taluk. The kernels are exported to Marseilles, while the oil finds its way largely to Burma. The residue or cake is shipped in large quantities to Java as a cane manure. The haulms are collected, dried and stacked for fodder and the husks are used for fuel or thrown on the manure heaps.

8. There are many points in this interesting crop which are worth investigating and there is plenty of work indicated on the Government farm.

All the varieties are being collected from the best groundnut-growing countries of the world. These are being grown side by side to see if there are any better suited than the "Mauritius" to the local conditions. The following have been thus far introduced and grown with varying results. The farm was started with *Small Japanese*, *Big Japanese*, *Tata's*, *Spanish*, *Virginian*, *Barbados*, *Mauritius*, *Madagascar* and *Pondicherry*. Several of these, proving to be none other than the local kind obtained from Ceylon, Poona and Pondicherry, were rejected. Another lot consisted of *Brazil*, *Small and Big Japanese*, *Saigon*, *Sine*, *Gambie*, *Hautsalom* and *Ruffisque*, but proved unsatisfactory, most of them failing to germinate. Four kinds have lately been obtained from America, two from Japan direct and one from the Transvaal, and these will be experimented with. A hundred-weight of nuts was obtained from Mauritius in order to determine whether, as so often stated, the local seed bearing the name of that country and presumably obtained therefrom had deteriorated. The sample received was very foul and nothing, either in growth, yield or amount of oil in the seeds tends to support the idea of deterioration. It is nevertheless doubtful if the true place of origin of the introduced nuts has been traced and it will, if possible, be determined later. It is hardly necessary to say that the nomenclature given above is in great confusion and it will take some years before the various kinds collected have been definitely separated from one another. Meantime experiments are being conducted with the local crop by seed selection to obtain distinct varieties.

For the valuation of the different varieties and for their botanical study, a very great number of points have to be held in view. The general health and size of the plant, its fruitfulness, the part of the plant where the nuts are borne, whether in a bunch round the root or all along the branches, the number of nuts at each node, the depth to which they penetrate, the time required to mature, the strength and

toughness of the stalks, the proportion of shell to kernel, the size of the nuts and their oil content have to be considered, besides facts regarding their liability to various diseases. To give a few instances, the *Spanish* has extremely small pods bunched together in a handful at the base of the plant. The yield is large as is also the proportion of shell to kernel. The plants are especially liable to tikka, but the nuts do not appear to be much attacked by millipedes. The *Mauritius* has its seed more scattered along the branches, they are uniform and of medium size, the yield is great and the oil content good, two at least are borne at each node, but, although not very liable to tikka, the seeds in the ground are much attacked and destroyed by millipedes. Then come the large-podded varieties such as *Tata's*, *Virginian* and *Big Japanese* which are specially affected by millipedes. The *Small Japanese* is easily distinguished by the large size of its leaves and its straggling habit; there are several stalks at each node, the pods are uniform and the kernels are distinguishable by their bright red covering.

As an illustration of the differences which are met with in growth, a couple of diagrams are appended showing the arrangement of branches and fruits on the old "local" kind and the *Mauritius* variety which replaced it. Considering the far greater number of pods on the new kind, its more compact habit, shorter period of growth and greater richness in oil, it is not to be wondered at that far greater profits were obtained from its cultivation.

A study of the groundnut flowers has been commenced with the object of ultimately attempting to cross desirable varieties and produce new forms. The fertilization of the groundnut flowers is, however, complicated by the fact that there are apparently two kinds of flowers, large, showy and infertile and small, inconspicuous, unopened and fertile. Crossing experiments cannot therefore be undertaken until a careful study has been made of the mode in which the fruit is produced. In preliminary examinations many of the large and supposed infertile flowers have been seen to produce pods, so that the generally accepted view must be received with caution until properly tested.

9. A set of varieties grown on the farm was sent to the Imperial Agricultural Chemist for oil analysis, and the results recorded. It is interesting to note that at present the local Mauritius heads the list, although the differences are small. It is quite possible that the introduced kinds may improve as they become naturalised, as is the case with sugarcane. It is to be noted that when the hundred-weight of Mauritius seed was received direct from Mauritius for planting on the farm, some of these seeds were sent for analysis direct. The result was in favour of the local nut, disposing for the present of the local claim that this variety had lost its oil-producing powers since it was introduced to the district. It is proposed to have oil analyses made of each crop. These will be recorded at present, as no useful purpose would be served by their publication until they are checked by a series of analyses in successive seasons.

Considering the short time during which the Palur farm has been in existence, the distribution of seed has not yet assumed any great dimensions. But it has proved a convenient centre from which good selected seed of the local kind could be sent to various parts of the

country where it was desired to experiment with the crop. Altogether between 1,000 and 2,000 lbs. have thus been selected and distributed, and it is hoped that this line of work may be continued and enlarged. Several of the new kinds of nut have been sent to local cultivators at their request, but, until a variety is discovered which is distinctly better than the local Mauritius, such distributions have been discouraged.

10. There are quite a number of points of interest in the cultivation of the groundnut which need and will probably repay investigation. It is at once evident to the student of the subject that the local practice differs very considerably from that followed in other countries, and it will have to be determined which practice is the best under the local conditions.

Depth of ploughing.—There is a very natural prejudice against deep ploughing with groundnut. It is pointed out that when the fertilised flower curves round and penetrates the soil, it will go on growing until it meets with a hard pan of some sort. Deep ploughing will therefore render harvesting difficult. This is well known in the district and such a practice is specially avoided in soft wet land. On the other hand, there is a memory in the country of an enterprising cultivator who worked the soil deeply and obtained a very fine crop. The relative importance of forming a hard pan at the depth of four or five inches and working the soil so as to conserve as much moisture as possible have thus to be considered and experiments have been commenced with this end in view.

Rate of seed per acre.—The local cultivators, as has been already pointed out, are accustomed to plant very closely. This is apparently connected with the desire to get the land quickly covered so as to avoid the expense of frequent weedings. But the cost of seed is very great. And, furthermore, the plants are so close together that many of the fruiting branches are quite unable to push their pods down. Experiments are being tried with seed planted at varying distances from one to two feet instead of 5 to 9 inches as is the local custom.

Closely connected with this matter is that of *planting in rows*. This method seems to be unknown in the district and an attempt will be made to introduce the drills and hoes worked by bullocks in the Ceded districts. It is hoped that not only will seed be saved in all the crops, but that weeding will be rendered easier and thus the labour difficulty will be less severely felt. The advantage of drill planting will be specially felt in mixed crops.

In lands liable to water-logging, it is the custom in the United States to *ridge the plants*, although this is not done in well-drained fields. But although no difficulty has been experienced in draining the land, it has been noted in the fields already planted on the farm that the plants on accidental ridges are always much finer and more luxuriant. The practice of ridging as carried out in many countries may be tried, but the matter will require careful study before anything definite can be decided.

The various *methods of planting* the crop, whether irrigated or rain-fed, on wet or dry land, should be studied as far as possible on the farm

to test their relative profitableness. So also mixed and pure planting and the various rotations which are in vogue. It may well be that, with a suitable rotation, greater yields of groundnut may be obtained than by continuous planting on the same land.

11. Not of least importance is the question of *manures*. The analysis of the soil given above shows that it is rather deficient in lime. Now this is universally regarded as the essential constituent for large crops of groundnut. While large quantities of lime are to be deprecated in a soil so poor in organic matter and lime itself is costly in India, a moderate addition should certainly be tried. Experiments might also be introduced with potash and phosphates, although the chemical analysis does not suggest any great deficiency in either of these constituents. There are certain local practices which may be investigated. To give one instance, castor-cake or indigo seed is applied, it is said with great profit, if given to a crop of ragi preceding the groundnut. Well-rotted cattle manure is said to be beneficial, but generally organic manures are not to be encouraged, unless given in the manner described to a previous crop. There is a very large field for such investigations and the land acquired has certain blocks which appear to be fairly uniform in character and are therefore well suited to manurial experiments. The accumulation of manure is one of the main difficulties in the district. It is closely connected with the fodder question, the introduction of cattle-worked implements and the growth of fuel-producing trees, all of which subjects should receive attention. With every available square yard of land cultivated, there is little chance of getting good manure supplies from the cattle. As has been the practice at the Samalkota farm, every weed on the farm is thrown into pits to rot. The weed-compost thus produced is viewed with great interest by the local cultivators and it is hoped that the advantages of saving up every bit of waste vegetable matter in suitable pits will be duly impressed on them. For this purpose, the falling leaves of the roadside trees were ostentatiously purchased for the pits, the "compost" from grass alone being inferior. The rotting of this material has its own difficulties in this dry climate, but the matter is being carefully studied and large quantities of the product are being applied to the land. Similarly, the cattle manure is being preserved on the loose box system in the shed instead of being thrown into the shallow refuse pits of the neighbourhood.

The question of *irrigating dry lands* is a difficult one, the labour involved being excessive and costly. The desirability of introducing an oil engine is being considered. For any great extension of the sugarcane area, this will probably be a necessity and several ryots have already put down their own. There is a large field for enquiry in this matter of irrigation, including as it does the sinking of supplemental wells in wet lands to eke out the rather precarious water-supply from the spring channels and tanks during times of drought.

12. Especial attention is being given to the various pests met with. The most serious and abundant is the "*Surul Puchi*" also called "*Mudu Puchi*," a small *timid* moth called *Anacampsis nexteria* *Meyr.* The leaves of attacked plants become much distorted, turn brown and finally drop off. In a bad attack every single leaf has been seen to turn black and die, the whole field appearing as if it had been burnt. If the attack comes fairly early, as it frequently does, this may entail very

serious, if not total, loss. The moth appears to thrive best in hot dry air, and showers of rain, as with most other pests, cause it to become unhealthy and disappear. It is not that the plant needs water at its roots, for some of the worst attacks are in irrigated plots which are regularly watered. The grub works its way between the two surfaces of the leaf and is thus protected from the ordinary spraying operations. These are being tried on the farm, but no great results are expected at present. Meantime the life history of the moth is being worked out and advantage is being taken of its strong predilection for light to inaugurate a series of light trap experiments. These are extremely simple. An ordinary cocoanut oil flame or indeed any source of illumination appears to suffice to attract the moths. The light is placed on a block of wood in a shallow tub of water, the latter having a film of kerosine oil on top. The first night that the light was exposed (on a plot about five cents in extent), 1,000 moths were collected and destroyed. During the fortnight in which the experiment was continued the numbers steadily decreased until only 48 were caught at crop time. The destruction of as many as 5,000 moths from this small area in so short a time appears to hold out prospects of this method of protecting the crop being a success. The experiments will be continued.

13. *Tikka* or *tambra novu* as it is locally called, is the work of a fungus leaf-disease. It presents the appearance of small brown spots of varying sizes on the leaves, and is usually more abundant in the lower, older leaves, especially where the ground is water-logged. Dr. Butler has identified the fungus as *Septogloeum Arachidis*, and has studied it in the Bombay farms. The attack there appears to be extremely severe and the sight of a plot which had been attacked by this disease may perhaps be regarded as the immediate cause of the founding of the South Arcot farm. The attacks are less severe in South Arcot, where the fungus, attacking as it does chiefly the old bottom leaves, has some of the characters of a saprophytic form. It was some little time before it could be definitely determined whether the disease was present in South Arcot. This was partly because the native cultivator had been accustomed to confuse it with the rather similar surul, but also because when the enquiry was started the irrigated crop was being grown. It is reported to be more often seen in the rainfed crops, when the land is soaked by the North-east monsoon rains. Just as surul is dependent on dry atmosphere, so tikka needs one saturated with moisture, and when the season is favourable neither of these pests assumes very serious dimensions. But a little careful search on the farm has always revealed the tikka even in irrigated crops and then especially in the more luxuriant plants near the source of irrigation. Spraying experiments do not appear as yet to have given very striking results either on the farm or in Bombay, but, on the farm at least, the experiment has not been tried until the disease has got a thorough hold of the plots, when all preventive measures are likely to be of little avail. Proper attention to draining the land seems likely to yield better results than anything else.

14. The third serious pest is a somewhat unusual one. A millipede known locally as *Maravattai* (thousand legs) has been convicted of boring into the pods, entering the nuts and, after eating a hole, making itself

a nest inside. The pest is difficult to locate because the millipedes are active and quickly leave the pod when disturbed. But a careful examination in the field at harvest time has shown without doubt that it is the true cause of the disease, while, when placed in confinement with fresh and healthy pods, it quickly makes its way inside them. The usual food of millipedes is the humus and decaying vegetable matter found in soils, and this active attack on living tissues therefore comes as a surprise. The crops in the neighbourhood of the farm, which were reaped in July 1906, were very badly attacked, and it was computed that the destruction in some cases was at least 40 per cent. of the crop. This then is a first-class enemy, and experiments have been instituted with salt to see if this will have any deterrent action on the millipedes.

These are the chief diseases at present met with in the South Arcot ground-nut fields. In the high dry red lands in seasons of exceptional drought a large hairy caterpillar called "*Kamblipuchi*" appears and increases to such an extent that whole fields are eaten away. This pest has been determined as being due to two species of moths *Cretonotus Moorei*, *Butl* & *Cretonotus albistriga* *Walk* with white bodies and scarlet markings. An unusually serious outbreak was reported on in Bulletin No. 38 (vol. II) of the Madras Agricultural Department.

From various places and at various times, reports have been received of a grub which attacks the young plant across just below the ground. This is therefore known as the "*Ver (or root) puchi*." While, probably, several insects unite to injure the young plants in this way, cockchafer grubs are perhaps the most abundant. In other cases a great number of deaths occur in exactly the same way, but an examination of the root shows no insect attack whatever. Here possibly some fungus disease is present or the plants have simply died from lack of proper nutrition or moisture.

There are several leaf diseases which at times assume serious proportions. These are either caused by *Acari* (mites) or *Thrips*. Sometimes large patches in the fields turn light yellowish-grey in colour owing to this cause and the plants become distorted and barren. Spraying would undoubtedly be of value in these cases and may be tried in the future.

Lastly, curious "*dwarf plants*" are to be met with where, instead of assuming the usual spreading habit, the plant forms a small ball a few inches across and produces one or two small nuts only. This is said by the local ryots to be due to sowing immature seed, and, if so, the matter is easy of observation and proof and can be as readily prevented. A very similar case is where, in the midst of an ordinary uniform block, certain plants assume an upright or semi-upright habit and remain small. Besides the pests enumerated above, mention must be made of the damage done by animals and birds in digging up the roots. Crows are specially active and do the greatest damage when the land is soft after irrigation. Jackals and squirrels are also to be guarded against, the latter especially when trees are near the fields.

All these pests and diseases are under observation and are to be found either on the farm or in its immediate vicinity. The work of studying the diseases of a crop is not all to be done in a day, but the subject is being actively prosecuted as opportunity offers.

15. While the main reason for founding the farm in South Arcot may be said to be the need for the thorough investigation of the groundnut industry, an almost equally strong case can be made out as regards that of sugarcane.

The introduction of improved varieties of cane into the Presidency has everywhere met with eager demands for the new canes. Among these applications many have been received from the south of the Presidency, and it has been found impossible to supply these wants from the Samalkota farm. The need of a southern depôt, from which the canes could be economically distributed, has been greatly felt, for, even with canes sent from the Gódvári district in good condition, they have frequently been unable to stand the long journey and the dangers encountered from transferring from the broad to the narrow gauge.

16. But besides this the condition of the local industry cannot be considered at all satisfactory. Sugarcane is grown in all of the eight taluks of the district, and in each taluk there is a more or less definite centre of cultivation. Thus in the Cuddalore taluk, Nellikuppam, with Messrs. Parry & Co.'s factory where the canes are crushed, may be regarded as the centre. Tirukkóyilúr has, as centre, Tiruvennanallúr, where another factory existed until recently. Kallakurichi has an extended cultivation, but the cusba (taluk head-quarters) of Kallakurichi town has many fields in its neighbourhood. In Chidambaram taluk, cane is grown in the cusba under the Coleroon and at Srimushnam under the Vellár. In Tindivanam sugarcane is cultivated chiefly at Gingee under the Varagánadi, in Tiruvannámalai near Chengam under wells and tanks, in Villupuram near the town of that name under the Pombay channel of the Ponnai, and in Vriddhachalam at Vriddhachalam under the Manimuktanadi and at Totagudi under the Vellár. Of these taluks only the first four need be considered here as the area in the rest is only trifling.

There are two main canes in the district, the *Namidari* or *Rustali*, a juicy, striped cane similar to that grown in most parts of the Presidency, and the *Naanal* or *Reed cane* a hard resistant variety with a small quantity of sweet juice. The district may be divided up according as these two canes are grown.

The Naanal is found in Kallakurichi and the part of Chidambaram where irrigation facilities are of an inferior description. Namidari cane is grown in the Cuddalore and Tirukkóyilúr taluks and also, to a small extent, in Chidambaram under the Coleroon for eating purposes. These two main sugarcane tracts differ in almost all respects, and have to be separately considered, both as regards the study of the crop and the possibilities of improvement.

There has been a very considerable decline in recent years in the acreage under sugarcane in the district. This has its main origin, of course, in the lower price paid for the product. The industry in South Arcot has been in the past bound up with European crushing mills and as these have either stopped working or have found it necessary to give a lower price for the canes, the cultivation has decreased. There used to be a factory in Kallakurichi, but this was given up about 1877. Details of this venture have not been as yet collected, but there appears to have been a better cane grown in the district then than the present

Naanal which is alone found there now. Messrs. Parry & Co.'s mill at Tiruvennanallúr has only recently been closed, and this has had an effect on the local acreage. Lastly, the large factory at Nellikuppam has not been able to pay a sufficiently high price recently to make it worth while for the cultivators to sink their money in sugarcane growing with such a profitable staple as the groundnut near at hand. This may then be regarded as the main reason for the falling off in acreage—the low price ruling during the last few years. The local canes are not of a sufficiently good quality to enable the cultivators to contend with the invasion of cheap foreign sugars. Diseases have appeared, it is true, and may also have contributed to the decline, but this is not nearly so much the case as it is in the Gódvári district and other parts of India.

The following table illustrates the preceding remarks:—

Sugarcane acreage in South Arcot.

1896-97	10,853	1901-02	9,466
1897-98	10,591	1902-03	6,674
1898-99	8,292	1903-04	4,023
1899-00	10,526	1904-05	5,425
1900-01	9,563	1905-06	6,168

From an average of 10,000 acres the area has decreased to something like 6,000 acres. There have been sundry temporary reasons for local increases in the price of sugar, such as failure in the beet crop or trouble in Cuba, but when these are over and the world's trade has become normal it is a question worth considering whether there will be any sugarcane to speak of left in the district, and this is the point from which we must start in our work on the farm.

17. A preliminary study has been made of the local conditions and these will be briefly recounted.

The irrigation of sugarcane in the South Arcot district is dependent upon the following sources:—

Channels from rivers or alicuts on them, tanks fed by the above and private wells on wet lands. The growing of canes under wells on dry land is at present purely experimental.

The only delta lands in the district are those at Chidambaram under the Coleroon and, the growth of canes there being small and only for eating, these need not be considered. The rivers are of small extent and generally rise and fall rapidly, but there are springs in the Ponnai and Gadilam, by means of which a perennial supply may be obtained in certain favoured localities.

Taken generally, however, the district is poorly supplied with water for sugarcane and the industry is carried on under difficulties unknown in the Gódvári district. In the matter of irrigation, as in other respects, the Namidari and Naanal canes differ widely from one another, the former requiring water all or nearly all the year, while the latter is content with much less. In Kallakurichi, the head-quarters of the Naanal, the hills rise sharply to the west and from them numerous mountain torrents pour down during the rains. These are tapped to feed many tanks. The chief rivers for sugarcane are the Gomudanadi

and Manimuktanadi. These two streams join together in the Vriddhachalam taluk and fall into the Vellár and the Naanal cane is continued as far as Srinushnam in the Chidambaram taluk under the latter river. There are as many as twelve masonry anicuts on the Gomuganadi alone. Canes are planted in April-May, being irrigated from private wells until the first freshes occur. The latter are expected usually in May-June. The soil under canes in this tract is a black loam.

The Ponnai and Gadilam traversing the alluvium formed in the past by these rivers irrigate the sugarcane land in Tirukkóvilur and Cuddalore, where the Namidari is the chief cane, and a branch from the Ponnai is sent to such lands as are cultivated in Villupuram. The irrigation is better in this tract, because of the spring channels met with, and a perennial supply is obtainable, although to only a small extent. This spring channel water is however sufficient to plant up the lands in April-May before the early rains make themselves felt.

18. The Naanal cultivation is in some respects the most worthy of consideration, for it is independent of the fortunes of the European firms which have established themselves in the district. Here alone is jaggery made and the local wants of the people catered for. Besides this, the area under cultivation is far in excess of that under the better canes, the whole of Kallakurichi and Vriddhachalam and part of Chidambaram being under Naanal. This will be seen from a study of the taluk areas for faslis 1310-13.

Sugarcane areas in the chief taluks.

	Fasli 1310.	Fasli 1311.	Fasli 1312.	Fasli 1313.
Kallakurichi	5,477	5,394	3,824	1,887
Tirukkóvilur	1,902	1,713	766	395
Cuddalore	480	463	523	591
Chidambaram	374	177	152	148

The Naanal cultivation in the Kallakurichi taluk is very old. It is also found in the neighbourhood of Perambalur near Trichinopoly, and, when seed is short at Kallakurichi, the cultivators are accustomed to obtain a fresh supply from that place. As already stated, this cane extends down the rivers after their confluence and reaches the Chidambaram taluk under the Vellár.

An interesting rotation is met with at Kallakurichi.—

1st year sugarcane		.. April-February.
2nd year indigo		.. April - July, and
Paddy		.. August-February.
3rd year sugarcane		.. April-February.

It is of special importance to note that the manurial value of indigo is fully recognised in that the crop is sent to the vats in return for the seed obtained from it which is applied to the soil.

The land, being lighter than that under Namidari in Tirukkóvilur and Cuddalore, is ploughed. Manuring in Kallakurichi is confined to a liberal picketing of goats, although tank silt is applied where possible once in three or four years.

The whole cane is cut up and planted at the rate of 9,000-12,000 sets per acre. There is no fencing to any of the fields, jackals, although abundant, not causing any appreciable damage.

There are four hoeings and, at the fourth, the ridges are changed into furrows and the furrows into ridges.

The tillering power of the cane is great and it is never ratooned.

The Naanal is very liable to a smut (*Ustilago Sacchari*). The moth borer, while attacking the tops and causing dead-hearts, does not enter the fully formed cane to any extent. *Striga* (a common root-parasite) is occasionally very abundant and is much feared, while the bush-form (*shurehkkuttek*) is not infrequent in low lying situation.

From the facts mentioned above it may be gathered that cane cultivation in the Kallakurichi taluk is of a very primitive nature, but the cane is also obviously of a very poor type, such indeed as could be most readily grown under the local conditions, and the methods of cultivation described are probably well suited to it.

Wherever the Naanal cane is grown the Beheea Mill is in evidence. The juice is sweet but deficient, the megass or residual fibre is abundant, the jaggery is white and is put up in small baskets of about a tukku ($1\frac{1}{4}$ viss) each. In Chidambaram they roll the jaggery into small balls in the hand.

An interesting feature which needs further study is the following. The cultivators of a village unite together and employ a common mill and set of pans. They send their cattle in turns, the stipulation being that one pair of cattle should only be used for the crushing of canes sufficient for one pan of juice. If this kind of co-operation could be extended to other parts there would soon arise the need for improved methods of jaggery-making, and larger plants might be introduced. The wages are the lowest in the district, men receiving 2 annas daily and women $1\frac{1}{2}$ annas.

19. The Namidari or Rastali is a thicker red-striped cane such as is commonly met with in many parts of the Presidency. It is the cane of Tirukkóvilur and Cuddalore taluks and is never grown mixed with Naanal. It was at one time grown in Kallakurichi but seems not to have been replanted after the famine of 1876-77 consequent on the removal about then of Messrs. Parry & Co.'s factory. It is usually grown in rotation with paddy in alternate years.

After the paddy is reaped the land is allowed to drain and, when dry enough, it is crowbarred. The large lumps are heaped up into rough ridges by hand and allowed to be acted on by the air for a month or more. Water is then let in and the cane sets are planted in a double row on each side of the channels.

Tops alone are planted, at the rate of 9,000-12,000 per acre. The cane is not cut up as its germinating power is inferior. There is no fencing practised although the cane is subject to the attacks of jackals. In some places sembsai (*Sesbania aegyptiaca*) is sown round the field, but this is more to keep cattle out. The sembsai stalks are used afterwards for fuel. There is no wrapping or propping with bamboos as in the Gódvári district.

Four hoeings are usually given and, at the last and most important one, a special set of channels and sub-channels bearing different names are formed. Castor cake is applied during the hoeings, either several times or only at the last one.

The tillering power of the cane is inferior to that of the Naanal. Ratooning is practised but is being discouraged by Messrs. Parry & Co. because of the inferior character of the juice.

Smut does not attack the Namidari cane, this pest being usually confined to canes of a primitive, reed-like character. *Mothborers* on the other hand, are very troublesome, attacking all parts of the young and old cane and sometimes, in the early part of a season with insufficient water-supply, destroying whole fields. *Jackals*, as already noted, are also sometimes very destructive.

While the Naanal does not appear to be subject to any marked degree to the "red smut" (*Colletotrichum falcatum*), fields of Namidari have been met with, in which the canes were thoroughly rotten with it. It is a fortunate circumstance that the natural drainage of the land under this cane is exceptionally good, as the cane is evidently by no means immune from this serious disease.

The cane gives much juice in mill, but it is watery and less sweet than that of the Naanal. The megass is very deficient, being only about half that of the Naanal. The jaggery is reddish or brown, being evidently coloured by the rind. But jaggery-making has been rare, the crop being absorbed by Messrs. Parry & Co.'s mills. The canes are crushed on receipt and the juice set aside. Two potfuls are then made into jaggery before the cultivator's eyes and this is analysed. He is paid according to this analysis.

20. The Sugarcane problem in South Arcot is thus seen to be of a simpler nature than that in groundnut. The industry is suffering from depression, owing to the inferior character of the canes grown. If new and better canes are not speedily introduced it is extremely probable that the industry will soon cease to exist, except where supported by a local demand for jaggery. In bringing down a number of cane varieties from Samalkota the fact has however been held in view that the requirements of Kallakurichi are very different from those of the more favoured taluks. Several hardy improved reed canes have been brought down and these must be tested, not at Messrs. Parry & Co.'s mill, but on the farm, in the manufacture of jaggery.

The following canes have been introduced thus far, and it has been easily demonstrated that some of them are vastly better than the local kinds :—

Striped Mauritius, Ashly Mauritius, Sports from Tanjore, Purple Mauritius, Kajli (from Bengal), Vansia (from Bombay), Yerra (from Gódvári), Local Segappu,	Red Mauritius, Green sports, Ivory Mauritius, White Mauritius, Langi (from Central Provinces), Sannabile (from Bombay), Local Namidari, Local Vellai.
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Eight of these have been planted under well irrigation on dry land. This has been done because of the attention being directed just now to the large underground water-supply in the tract between the Ponnar and Gadilam and the possibility of tapping this economically by oil engine or other pumps.

The canes planted in the first year have been analysed. The results are not very encouraging, the sucrose content being far lower than at Samalkota. But it may be noted firstly that many of them were undoubtedly over-ripe when tested, and, secondly, that, where they were not so, this result is in strict accordance with the experience gained elsewhere on the introduction of canes into new surroundings, there usually being at first a great decline in the richness of the juice followed in a few years by a marked improvement. It will be of interest to note if this is the case with our canes at the Palur Farm. The analyses were kindly made by Messrs. Parry & Co. at their Nellikuppam factory.

There is no doubt as to the interest evoked by these fine canes in the district. All the sets available were eagerly taken up in spite of the extremely unfavourable season, and large consignments had to be brought from Samalkota to plant up the area marked out. This forwardal of canes from a distance has, however, been a very troublesome business and many arrived in a very mutilated condition owing to the packages having been tampered with *en route*. It is hoped that further consignments will not now be needed and that, with the eager help afforded by Messrs. Parry & Co., the new canes will rapidly spread over the area worked by their factory. The other part of the district can then be rapidly supplied. It may be added that a second nursery for distribution has been started at Melrosapuram, which is irrigated by an aermotor from a well. This is intended entirely for distribution, and should relieve the stress caused by the demands from various parts in the south of the Presidency.

Later on experiments may be tried with manures and different methods of working the soil and treating the canes. The local conditions are so entirely different from those prevailing at Samalkota, that it will take some time before definite lines can be laid down for experiments. Meantime the distribution of the canes which seem best adapted to the various South Arcot regions, will be multiplied as rapidly as possible, and distributed broadcast. It will be seen that the water-supply of the district is specially poor at the time of planting the canes, April-May. This lends quite exceptional importance to the experiments, which have been conducted elsewhere in raising early-maturing canes or at any rate in planting canes, whether by nursery or otherwise, before the full water-supply arrives. The nursery system, by which the canes are first planted thickly in seed-bed near a good water-supply has been introduced on the farm, and appears to have attracted a good deal of attention among the cultivators. But it would be dangerous to apply it to an unlimited extent until the special conditions of the district are further studied. All that can at present be said is that South Arcot seems to be pre-eminently a district in which some such system would be of value. Experiments will be continued for the adaptation of the system to the local climatic conditions.

21. Besides groundnut and sugarcane, various other crops have been grown on the farm. These are of course needed to provide suitable rotations, and experiments with those rotations including groundnut will receive special attention. Among these crops, perhaps the most interesting is *Indigo*. In many respects indigo and groundnut are suited to the same kind of soil and climate. This is brought out very clearly,

when we recall the fact that, before the spread of groundnut, South Arcot was celebrated for its indigo, and we are told that European enterprise and capital were first directed to the district because of its fame as an indigo producer. At one time there appear to have been not far off 100,000 acres under indigo, and as many as 20 vats are still in existence in the village of Palur. But long before the commencement of the recent crisis in this staple, the battle was fought out between groundnut and indigo, and the latter was everywhere defeated. The acreage under indigo has now sunk to insignificant dimensions, and there is little prospect of its revival. But, besides the known suitability of the land for indigo, there is another reason for paying the crop somewhat marked attention, and desiring its resuscitation, namely the excellence of the spent leaves or "seet" as a manure. As has already been indicated, the question of manures is a leading one in the district and the preservation of the indigo planting, whether as a rotation crop or as one grown purely for securing a valuable manure, is well worthy of some effort. For this reason a number of kinds of indigo were introduced on to the farm at its foundation. But a further reason for this action was, that with the help of the late Superintendent of the Royal Botanic Gardens at Calcutta, a thorough examination had just been concluded of the native and cultivated indigos of the Presidency, and a number of samples of fresh seed had been collected. During this survey three facts of interest had transpired and these led to the introduction of certain special varieties on the farm.

(1) In observing the local fields of indigo it was noted that a considerable amount of variation occurred. On this being pointed out to the cultivators, they at once acknowledged that the crop was not a pure one, but that there were two kinds, the Nandyal kind grown from seed imported fresh every year, and the "*Natt Averi*" the local indigo of an inferior value. Various reasons were given for this admixture but the chief one seems to have been that the Nandyal seed cost about four times as much as the local. On reference to Calcutta and further enquiries it was found that the fight which had been going on in all parts of India for years past between *Indigofera tinctoria* and *I. sumatrana* was still going on in this, the southernmost place where the crop was growing. It is probable that South Arcot and Tanjore are the only places in India where *I. tinctoria*, the native Indian variety, is still cultivated.

(2) Another fact was the now well-known introduction of the new species *Indigofera arrecta* which seems to be so successful in Behar. This species is entirely different in habit from *I. sumatrana*, and from the mass of foliage produced and the excellence of its dye, has been very favourably commented upon. The cost of production and manufacture of indigo is so small that, in spite of the low price, it was thought that a handsome profit could be made if the new kind was successfully introduced. Seeds were accordingly obtained and great care was also taken that this seed should be properly prepared for sowing, the germination being very poor if not specially scarified.

(3) Lastly, *I. longeracemosa* was rediscovered in Travancore. This kind, which had been collected there years ago and subsequently lost, had the reputation of producing the best dye of all. Seed was therefore obtained by a special plant collector, and this was sent to Calcutta and Pusa and also to Java. Some of it was also sown on the farm.

22. The following kinds of indigo were sown as a rotation crop:—*Nandyal* seed from Nandyal, *Nandyal* seed which had been grown for one year at Villupuram, *Prodattur*, *Tanjore*, *Delhi*, *Cocanada*, *Cocanada* which had been grown for ten years at Villupuram, *Country seed* (*I. tinctoria*), *I. longeracemosa*, *I. arrecta* from Pusa, *I. Anil* (another native species discovered in the Satyamangalam taluk of Coimbatore).

The results are easily given. There was no doubt as to the superiority, for the local needs, of the ordinary seed obtained from Nandyal or Prodattur. The opinions of local indigo men were taken on all, and although some of the kinds interested them, the yield of leaf was disappointing. The greatest difficulty was experienced in germinating the *I. arrecta* from Pusa. In the second season it was grown in three ways. Our own seed was planted again. Fresh seed was obtained from Pusa and scarified locally, and to be quite sure that this was done correctly, some seed was sent by post from Pusa carefully prepared there for sowing. The results seem to show that this variety is unsuited to the climate. It may be suggested that, its natural habitat being a temperate one, *I. arrecta* finds itself out of its element in the severe heat and droughts of Southern India. It is being grown on and will be kept on the farm in small patches. *Indigofera longeracemosa*, while presenting a handsome appearance and producing a good leaf, does not yield anything like the quantity obtained from the Nandyal variety.

It is perhaps fair to state that the season was exceptionally unsuited for indigo, no rains falling in December at all, and very little was planted locally by the ryots, but this does not detract from the superiority shown of the Nandyal kind usually grown.

By the kindness of Mr. Bergtheil, the Imperial Bacteriologist, I was able to have a set of local indigo cakes analysed. As is well known, the Madras product fetches a far lower price in the market than that of Bengal. Mr. Bergtheil remarks on these: "The Madras indigos are all of very poor quality indeed, the highest indigo in content being 34.4 per cent., whilst a fair average Bengal indigo contains about 60 per cent."

In the recent purchase of land, an indigo vat in good condition has been acquired. This will be kept in order so that, if we wish to try any experiments later on in the improvement of the local product, we have the means ready at hand. Meanwhile indigo will be grown on in the farm as a regular rotation crop.

23. As is usual just now in South India, some samples of *Caravonica Cotton* were grown on the farm, but, although the plants have lived and are healthy, they have not yet produced any bolls after 9 months in the ground. *Rivers Sea Island cotton* on the other hand has flowered well and the lint and seed are being collected.

Cholam as a fodder crop was also introduced, but the severe drought of the present year caused the growth to be feeble and the crop was a poor one. It need not be insisted on that the question of cattle fodder is an important one in the district, and any means of improving the local supplies will be hailed with satisfaction. For this reason, *Guinea Grass* (*Panicum maximum*) was introduced in the outskirts of some fields. The growth has been very good and several applications have been

received for roots. It should prove of value in planting up waste places along hedges and near the cultivators' dwellings.

A more important crop is that of *Rimilipatam jute* (*Hibiscus cannabinus*). This has been grown on the farm and fibre made from it. Experiments are now being made with *true jute* and *sun hemp*, the latter both for fodder and fibre. With a local import into Cuddalore alone of 1½ lakhs of gunny bags from Calcutta annually for the groundnut trade, there should be a bright prospect for this class of fibre in the district. It should be borne in mind also that any new paying staple which takes some of the overworked land from groundnut has a value quite independent of the actual profits gained from the crop, and the experiments with fibre plants of the jute type will be prosecuted earnestly, now that it appears that the soil is well-suited to them.

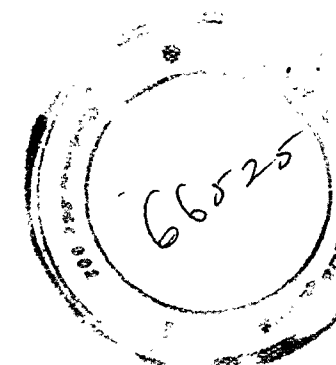
Other crops will doubtless in due course receive attention as their local importance is recognised, but enough has been said at present, it is hoped, to justify the action of Government in purchasing the land and deciding to make a permanent farm at Palur before the stipulated two years of probation have run their course.

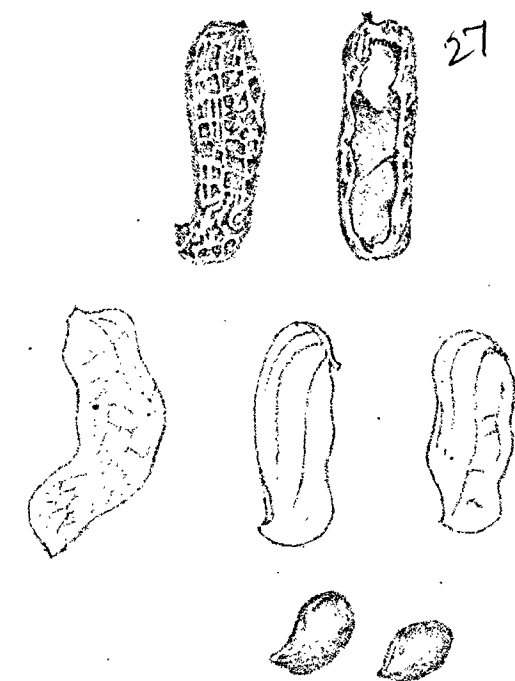
SUMMARY.

1. Introduction. Location of the farm.
2. Character of the land and analysis of the soil: water-supply and rainfall: floods.
3. Work at present, chiefly laying out and preliminary study of local condition.
4. The rise of the groundnut industry traced.
5. Its position among the local crops. The dangers of overplanting with groundnut.
6. Rainfall of the district and its influence on the crop. Irrigation by wells.
7. The rainfed crop: cultivation details.
8. Varieties collected on the farm and their study. Fertilization and crossing.
9. Oil analysis and distribution of seed.
10. Lines of work with regard to groundnut.
11. Manures. Irrigation.
12. (1) Surul.
13. (2) Tikka.
14. (3) Millepedes and others.
15. Sugarcane. A distributing centre required for South India.
16. Centres of cultivation in the district. The local industry declining.
17. Irrigation sources. Classes of canes.
18. Naanal cane cultivation.
19. Namadari or Rastali cane cultivation.
20. The sugarcane problem. Introduction of new canes. Their analysis and distribution.
21. Indigo.
22. Varieties introduced and the result.
23. Other crops:—Cotton: fodder crops: jute.

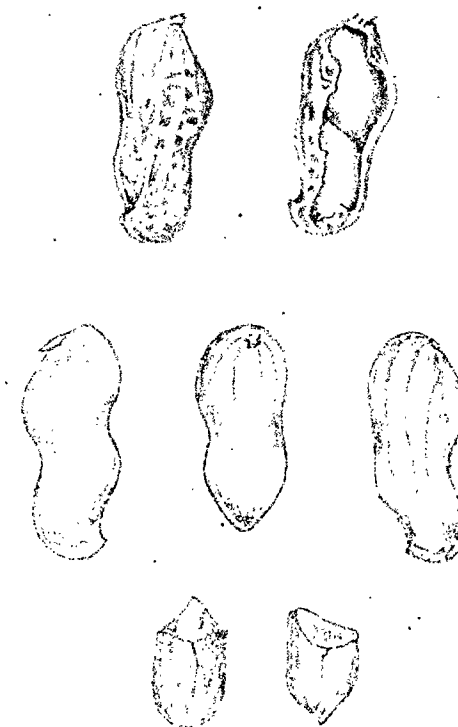
Pests—

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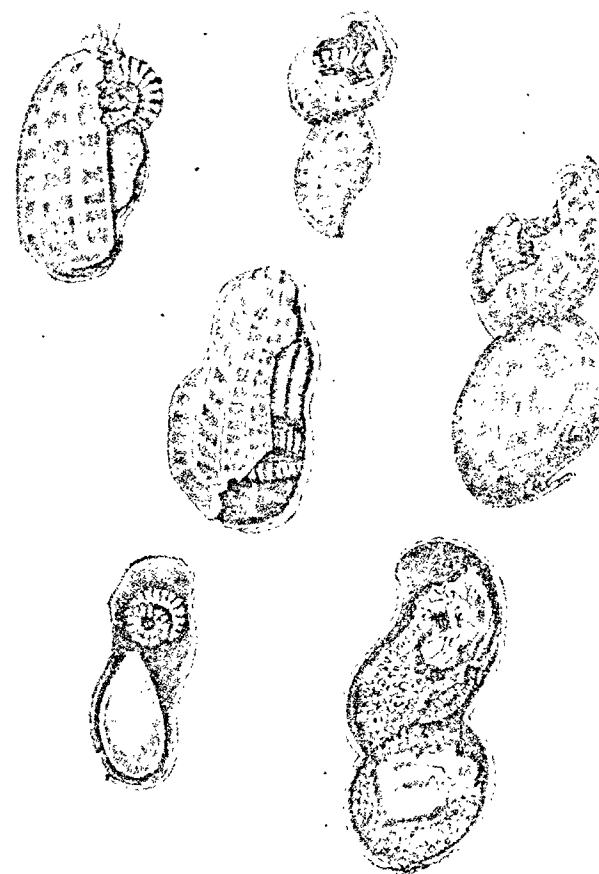




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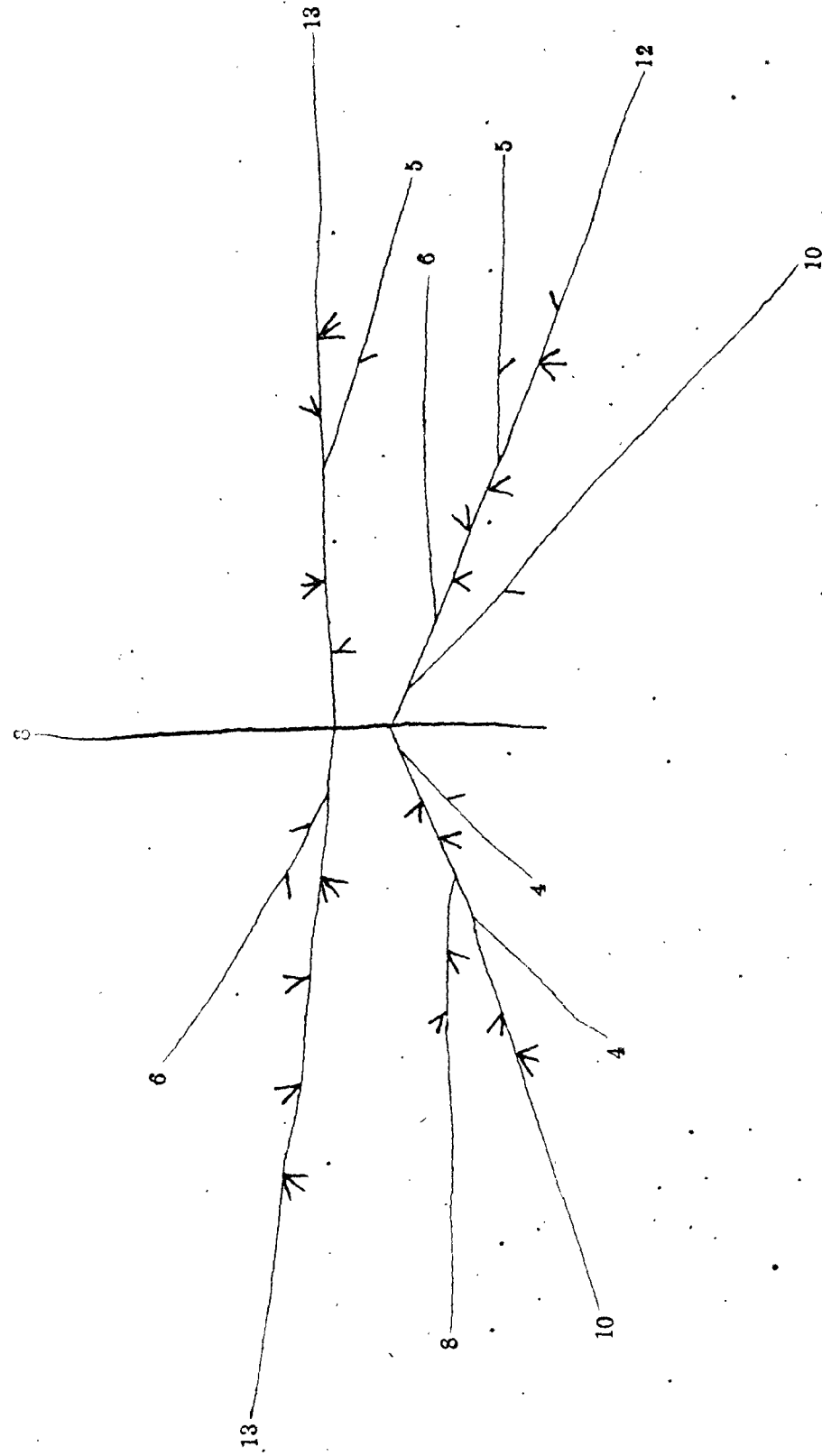


Groundnut. Varieties
(1) Local kind & (2) Mauritius
groundnut which replaced it.



Groundnuts eaten by Millipedes.

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1907. { Copies — 200



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DIAGRAM ILLUSTRATING FRUITFULNESS OF
MAURITIUS GROUND NUT

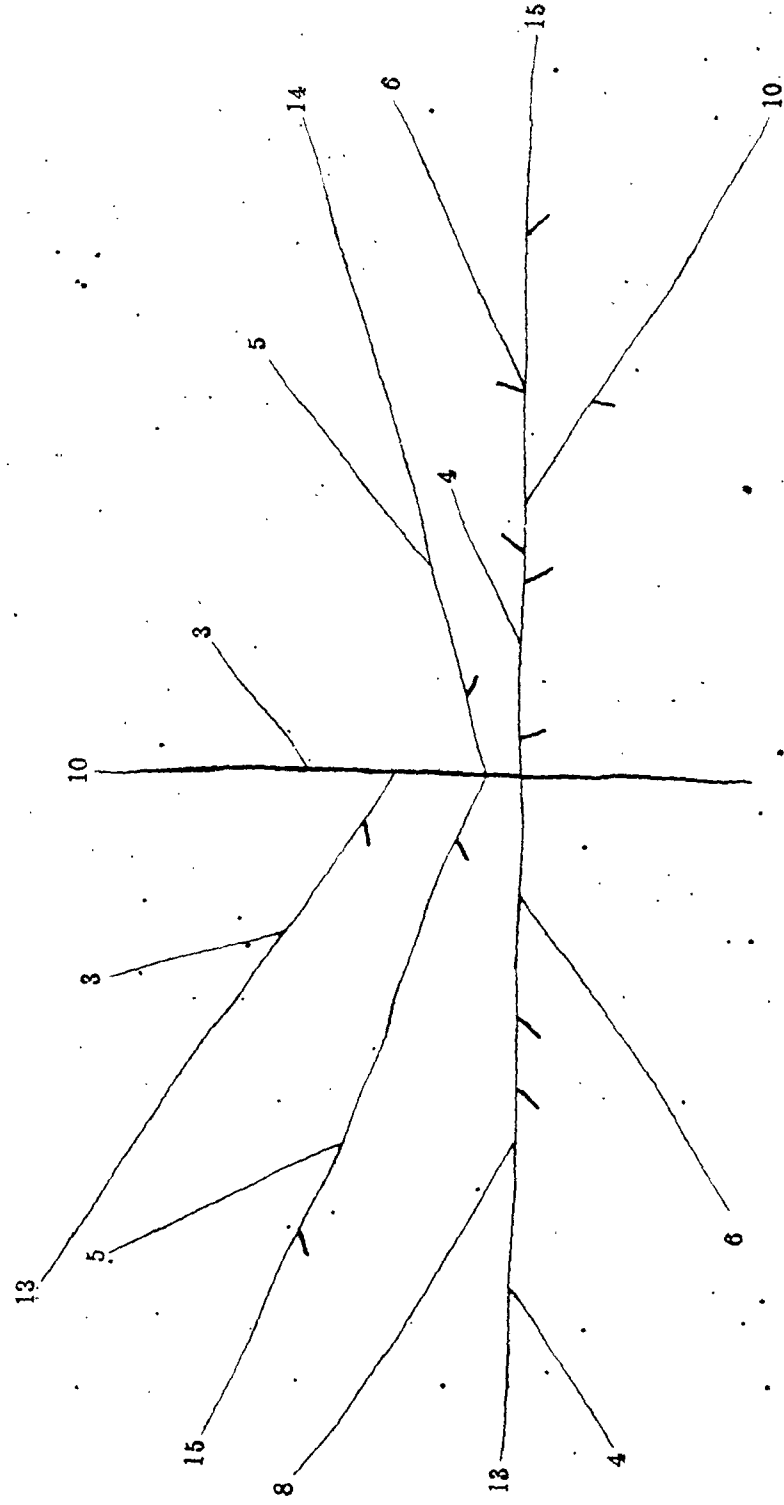


DIAGRAM ILLUSTRATING FRUITFULNESS OF
LOCAL (COUNTRY) VARIETY

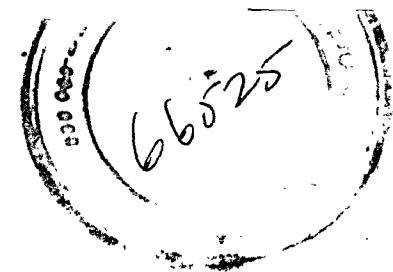
The dark short lines are pods & the
numbers represent the length of the branches in inches.





Gronovst. Healthy Leaves & those
affected by Sarul.

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J. 2114 P. 8 N05
N07



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