

(i)



Sugarcane Prize Essay.

1. **A Gold Medal** (value Rs. 50/-) will be awarded for the best essay on the following subject:—

The sugarcane crop, its characteristics, limitations and possibilities.

2. The prize will be called 'The Sugarcane Prize' and will be given by M. R. Ry., T. S. Venkataraman, B. A., of the Madras Agricultural Department.

3. The competition is open to all the members of the Union, including Honorary Members and Associates.

4. The essays should not be more than 16 pages, typewritten on one side.

5. The essays should be sent in so as to reach the General Secretary, not later than 30th April 1916, with a covering letter showing the full name and address. The essay itself should be subscribed *nom de plume*.

6. The essays will be valued by a committee of five judges who will be decided by the Working Committee of the Union.

7. The results of the judging will be announced in the July issue of the journal and the prize will be awarded at the Agricultural Conference in July 1916.

8. The Working Committee of the Union reserves to itself the right of publishing the first or any of the essays, in the journals of the Union in the first instance.

9. All references to published books, reports or papers should be given as footnotes.

10. A sum of Rupee one will be sent by each competitor to meet a portion of the cost of typing a sufficient number of copies to be distributed to the judges.

11. All members of the Union are invited to compete. For further particulars, apply to the General Secretary of the Union.

(ii)

The Munagala Prize Essay.

1. **A Gold Medal** (value Rs. 50/-) will be awarded for the best essay on the following subject:—

The relations which at present exist in this Presidency between farmers and their servants, and suggestions for their improvement from the point of view of both parties.

2. The prize will be called 'The Munagala Prize' and will be given by M. R. Ry., K. R. Ramasastrulu Naidu Garu, B. S. of the Madras Agricultural Department.

3. The competition is open to all the members of the Union, including Honorary Members and Associates.

4. The essays should not be more than 16 pages, typewritten on one side.

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THE JOURNAL

OF

The Madras Agricultural Students' Union.

Vol. IV.

January 1916.

No. I.

N.B.—Contributors are requested to send in their contributions written legibly in ink on one side of the paper only.—Editor.

The people's Park Fair and Exhibition.

CHRISTMAS 1915.

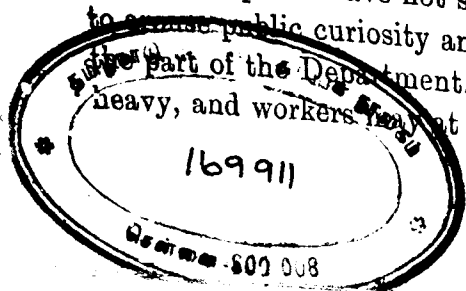
We hope few of our readers missed this Show, which was interesting not only for its novelty but also for the many excellent exhibits which were to be seen there. In the fullest sense too, amusement was combined with instruction and for those who were bewildered by the completeness and the intricacy of the instructive exhibits, there was always opportunity for relaxation.

The agricultural Department was, as might have been expected, well to the front, with a series of exhibits which, for variety and completeness, compared well with any other on the ground. It was clear to the intelligent observer that a deal of steady preparation underlay even the simplest of the striking series of diagrams and specimens.

which they displayed, while the crowds which daily thronged the section, showed that the organisers of the exhibit had accurately gauged the public taste. This very popularity in fact detracted to no small extent from the educational value of the display, since with the best will in the world, the numerous demonstrators were unable to reach more than a small section of their audience and the mere sight of many of the exhibits was at times almost a physical impossibility.

We hope to be able to print some of the papers which were read in Madras in connection with the Exhibition. A happy scheme was arranged for the delivery of short lectures by experts on some aspect of the work with which they were most intimately concerned. In the rush of Christmas time in Madras and the number of competing attractions it was perhaps too much to hope that the audiences would be very large, and for that reason we are particularly glad that they are to be printed and thus made available to the widest possible circle. Officers of the Agricultural Department were responsible for four such discourses, Mr. Chadwick the Director, Mr. McRae the Mycologist, Mr. Ramakrishna Ayyar, the acting Entomologist, and Mr. Ananda Rao, who spoke on Dairying, a subject which the model Dairy which he had been running in Madras, had brought prominently to the notice of the public.

We hope we have not seen the last of these efforts to create public curiosity and stimulate public interest on the part of the Department. The price paid is no doubt heavy, and workers at times feel discouraged by what



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appears to them a waste of time and energy, which might be devoted to what seems at the time more pressing work, but abhorrent though advertisement is to the sincere worker, it is only by bringing to the public the valuable results which have been already produced by his work, that he can obtain due recognition and the chance of embarking on wider schemes. There should be few among the educated classes who have not by now heard at any rate of the Department.

Growing green manure crops in Tanjore Delta.

The following extract from paper read at the annual meeting of the Kumbhakonam Agricultural Association by M. R. Ry. Rao Sahib A. Ram Rao, Farm Manager Manganallur, will be of interest to our readers.

* * * * *

You know we are not getting the same amount of fertilizing silt through the River Cauvery as we were getting some decades back owing to the damming of the river higher up for the extension of irrigation and other works which cause the deposition of the silt in the beds of the river and the channels and its distribution over a larger area than formerly.

It is therefore high time for us not to depend any more on the silt brought down by the river, but to take to other means of manuring our lands in order to get remunerative yields which are most essential for self preservation in these days of increasing population and keen competition.

The manure of cattle and other domestic animals in the Delta is too small to meet the demand to any appreciable extent and in fact the quantity available is hardly sufficient for seed-beds and Kuruvai fields which form a very small portion of the wet area. We know there are also no facilities for increasing the number of our cattle for manuring and breeding purposes.

There are no forests to supply the manure leaf required for our wet lands though the cost of gathering and carting the leaf often proves prohibitive.

Certain Drawbacks TO BE OVERCOME.

I mentioned above that the growing of green manure crops is beset with some difficulties and it is now our purpose to consider the difficulties in detail and seek remedial measures.

The first and foremost complaint is that the green-manure seeds do not germinate in all soils and though they germinate the plants die at a certain stage. This is true to some extent and is chiefly due to the bad physical condition of the soil which cracks badly in summer and parts with its moisture too rapidly with the result that the young green-manure plants wither away and die for want of moisture to keep them green. The stiff and impervious nature of the soil is also responsible for the non-germination of certain kinds of green manure seeds, the young plants of which are too delicate to push through in such soils, e. g., the wild Indigo (Káválai).

The question then naturally arises as how to grow green-manure crops for improving such soils. The answer is that if we choose the green-manure crop suitable to the soil and modify the methods of growing and handling it we can, no doubt, attain our object.

Daincha.

Now in soils which are too stiff and hard and even saline for Káválai we can grow Daincha by sowing the seed in the standing crop of paddy just at the time of draining the fields before the harvest instead of sowing it in the fields much earlier as we generally do in the case of Kavalai. The Daincha seed germinates in a few days after sowing and attains a certain height by the time the paddy is cut just above the heads of the Daincha plant which will then be about a span in height.

The Daincha continues to grow till the moisture in the soil is entirely dried up i. e. for a month or two after the harvest of paddy. In the meantime if we get a shower or two, the life of Daincha will be

extended and we will get the full crop. In the 4th month after sowing when the plant will be in full development and about 5 feet high, the crop should be cut close to the ground and preserved in the field to be applied to the land at the time it is prepared for paddy. If, on the other hand, the crop prematurely shows signs of withering on account of severe drought, it should be cut immediately and preserved for manure before the leaves are shed.

If you take the trouble of producing the crop the ways of preserving it, till required for use, are simple and easy and I am here mentioning a few methods from which to devise your own.

The stalks can be tied into bundles, immediately they are cut by twists of Daincha itself, and stacked at convenient spots and weighted with clods of earth to prevent their being blown away by wind. Kulivettu earth can be used for this purpose. Babul or other thorns can be planted all round to prevent any stray cattle interfering with the stack.

They can be pitted with a covering of a foot or so of soil, preferably damp soil, at the top and the compost thus formed can be applied to the same land on which the green manure crop was grown.

They can be built up into a rectangular stack about 5 feet high with alternate layers of damp soil and the top finally covered with soil and given a slope for the rain water to drain off. The sides also are plastered with damp soil. Under this method we can get about 2 cartloads of green leaf per acre which will form a fair dressing for the same area and this is of great moment in a place where manure is so scarce. The seed rate for Daincha is about 3 Madras measures per acre.

There are complaints from certain quarters that Daincha is destroyed by stray cattle. But this difficulty can be averted by growing Daincha on a sufficiently large scale in a portion of the village under Co-operative combination and putting a watch over the crop till it is cut and preserved.

Kávalai.

For loamy soils which are loose and friable and possess drainage facilities, on account of a proper proportion of sand they contain, Kávalai suits best as most of you know. The Kávalai seed is sown either in the dressed or in the undressed state. The dressed seed should be sown in the standing crop of paddy at the time of draining the fields before the harvest, and the undressed seed should be sown in the puddled fields at the time of transplanting paddy or at weeding.

The dressing of the seed is done by spreading it on a layer of sharp sand and getting it trodden over by cattle for about an hour. The seed gets scratched in the process which facilitates early germination owing to the water easily soaking into the seed. If a small quantity of the seed is to be dealt with, the dressing may be done by pounding equal quantities of Kávalai seed and sand in an household mortar for about half an hour each charge. In both cases the seed can be freed from the sand by sifting and winnowing. The skin of the Kávalai seed is very hard and the seed remains dormant in the soil without losing its vitality for a long time even under water-logged conditions and sprouts only when the excessive moisture is dried up. This quality in the seed is advantageous, because, though the seed does not sprout in the first year, we can expect a crop of green manure in the second year, provided the soil is suitable. The crop becomes self sown in course of years by shedding its seed on the land and this obviates the necessity of sowing it every year. The Kávalai plants are not eaten by cattle and goats.

It will be quite a fortunate time for India when all her wet lands are made suitable for bearing a crop of Kávalai when the lands are idle, and this end can be attained when the land is improved by growing other green manure crops in the beginning. The seed rate for Kávalai is 4 measures per acre. The plant can be ploughed into the soil or pulled up and applied to the land at the time the land is prepared for paddy, or it can be gathered and preserved till required, in any of the ways mentioned under Daincha. About 2 cartloads of green leaf can be got from an acre of land.

Indigo.

Indigo is grown on a large scale near Ayyempet for green manure as most of you know. The seed for this can be sown on land, which is a little too stiff for wild Indigo but not so stiff as to crack badly, at the rate of 3 Madras measures of seed per acre. It should be sown in the standing crop of paddy when there is still moisture after the fields are drained before harvest. The crop yields as good a quantity of green stuff as any other green manure crop. It will be interesting to know that in some parts of Ceded Districts the ryots are making very good profits by growing Indigo as a second crop after paddy for making the dye. They put the leaf refuse back into the soil which is thus kept on increasing in fertility. There is no reason why we should not hope to get such crops of Indigo by improving our soils with sufficient manuring.

Other sources of obtaining the leaf manure.

I may here mention that the green leaf available from other sources, in whatever quantity it may be, should not be neglected. Kávalai is seen growing wild on certain dry lands and also on the river and channel banks from which it may be cut and removed with the permission of the Public Works Department. There are Portia, Nim and other trees and shrubs which can contribute leaf to a certain extent. All such leaves should be carefully collected and applied to the land which will otherwise go without manure.

The advantages of growing green manure crops.

The advantages of growing green manure crops and applying them to the land are briefly these.

They, as leguminous crops belonging to the sub order papilionaceæ, absorb Nitrogen from the atmosphere which is a valuable manure for grain crops. They also take up from the soil certain crude manurial ingredients which cannot be easily assimilated by the grain crops and present them to the grain crops in a more readily available form. When they decompose in the soil they evolve certain acids which dissolve the inert plantfood in the soil and make it readily available for the crop. They improve the physical texture of stiff

soils like our Delta soils *i. e.* they make them more free and friable which quality improves natural drainage, enables the roots of crops to go deeper and feed over a greater range, makes the ordinary deleterious salts to be washed off easily and renders the soils to be easily worked which is an advantage to weak cattle like our Delta cattle.

The organic matter supplied by these crops is a very valuable ingredient in Indian soils which are subjected to a great parching heat. The presence of this organic matter in sufficient quantity enables the soil to absorb moisture from the atmosphere and retain it for a longer time than soils which are deficient in it and tide over the ordinary periods of drought.

Therefore the addition of organic matter to our stiff Delta lands by growing green-manure crops will correct their adhesiveness and prevent them from cracking badly as they do now. This condition is quite essential for growing all green-manure crops successfully without any chance of losing them half way as we do now because in this case the roots of green-manure crops can go deep in the loose and friable soil and thrive by absorbing the moisture which is provided by the organic matter present in the soil.

To quote an instance I may here mention that at Sholavandan in Madura District the texture and natural drainage of an ordinary saline land is so much improved by the growing and applying of Daincha as green-manure that the yield of paddy rose to 850 Madras measures per acre while the yield in the previous years never went up beyond 175 Madras measures per acre. At Sivagiri where Kavalai was regularly cultivated for some years the yields of paddy increased from 600 to 1300 Madras measures per acre.

Our aim and object should be to increase the organic matter in our soils by growing certain green-manure crops and applying them to the land in the way mentioned above so that in course of time the matter of growing green-manure crops on our stiff Delta soils may become quite easy and common, not to speak of other advantages which are manifold.

The Influence of the War on Tropical Agriculture.

by W. G. Freeman B. Sc. A. R. C. S., F. L. S., A. D. A. of Agriculture.
Bulletin of the Department of Agriculture Trinidad and Tobago.

COPRA.

Germany and France are two of the countries in Europe which have long been great centres for oil, Hamburg and Marseilles being two of the greatest oil crushing centres in the world. Germany imported 230,000 tons of copra per year of which 124,000 tons came from various parts of British Empire. Austria Hungary imported 34,000 tons getting 29,000 from British sources. France imported 153,000 tons getting 20,000 from British sources. That trade has been practically stopped altogether and copra is no longer exported from British sources into Germany and Austria, so that to a certain extent British coconut producers have lost important markets. A curious situation has arisen because, although Germany imported this large amount of copra, she also exported coconut oil to the extent of 41,000 tons per annum, no less than 30,000 going to the United Kingdom which imports from foreign countries to an extent equivalent to 82,000 tons of copra per annum.

If the oil-plants in England could readily be adapted to the manufacture of coconut oil from copra they could take over the very large amount which formerly went to Germany and Austria and for which the market has been lost. The Imperial Institute in London is interested itself in the matter with its new Technical Information Bureau, and is endeavouring to put people who are interested in the manufacture of copra into touch with exporters in various countries.

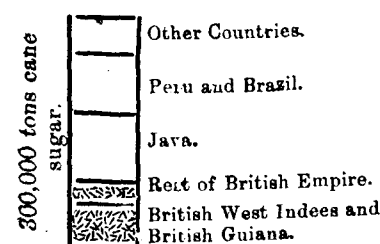
SUGAR.

If you go back further, more than 100 years ago, we know that the sugar cane was the dominant plant and the sole source of sugar for the civilized world. Still earlier in 1747 a German chemist, Marggraf, had shown the possibility of getting sugar from the beet. In 1797 a French refugee, Achard, continued the work and about the

beginning of the last century the first experimental factory for beet was started in Silesia with a capacity of something like 525 tons of roots a year which could probably produce about 30 tons of sugar. The baby-hood of beet industry was greatly affected by continental wars. Napoleon attempted to stifle England's commerce by a continental blockade, his main object being to keep out from Europe the products of British Colonies which at that time were chiefly cotton, sugar and Indigo. The result of this was a great impetus to beet industry and Napoleon himself in 1811 ordered that 80,000 acres in France be planted with beet. The industry flourished for a time and in 1812 there were 40 beet sugar factories producing 10,000 tons of sugar per annum. After the Napoleonic wars the industry dropped again and in 1829 the beet sugar production was only 4000 tons. In 1835 Germany took up the industry seriously. By 1860 the world production of sugar was 1,500,000 tons, cane sugar 1,250,000 and beet 250,000. In 1871 the roots in both France and Germany contained 6% sugar; in 1884 those in France had not improved whilst in Germany it rose up to 11%. This was due to the German system of taxing the roots that went into the factories and not the output of sugar as in France. France then adopted the German system of taxing with the desired effect of raising the sugar content to 11 per cent. and increasing the output of sugar to 1,500,000 tons against 1,850,000 tons of German sugar. By that time the sugar content of Germany had risen up to 12.66 per cent. In 1892, Germany altered her system from duty on roots to duty on sugar with a direct bounty or bonus of £ 5/- per ton on exports. The other continental countries worked on more or less similar lines and as a general result the beet industry increased to 6,000,000 tons in 1903. During the same period the sugar cane production had grown up to 5,800,000. Brussels convention of 1902 abolished the beet sugar bounty in 1903. By 1914 beet had only gone up to 6,800,000 whereas cane sugar had progressed from 5,800,000 to 9,000,000.

At present Germany and Austria produce more sugar than the whole of the British Empire. The total amount of sugar used in the United Kingdom is 1,800,000 tons; beet 1,500,000 and sugar cane only

300,000 of which only a small amount comes from the British Empire; the relative proportions are shown in the diagram.



Since 1903 beet and sugar cane have competed on equal terms. Beet has got the great natural advantage that it is produced near the great centres of consumption and thus has a natural protection in the form of 'Cheaper Freights.' The one great disadvantage is that beet sugar impurities are very objectionable compared with those in cane sugar. Mr. Aspinall, the energetic Secretary of the West India Committee had a bottle of raw cane sugar and another of raw beet sugar on his office shelf. After keeping the latter for a short time it developed a most offensive odour.

At the outset of the war the Home Government purchased 900,000 tons of Sugar at £ 20/- per ton—the biggest sugar deal ever made in the world. It stopped imports to avoid German sugar coming through neutral countries. The war has not up to the present seriously affected the French output of beet sugar except in Northern France. Therefore the immediate difficulty in Europe is not so much the production of sugar, as getting rid of it. Accordingly much is being stored, causing demand for proper storage facilities as there is lack of suitable warehouse accommodation for very large quantities of sugar. Supplies in England are said to be sufficient to last till May but an early peace will liberate large quantities of sugar with a consequent drop in prices. Speaking in the House of Commons in February, Mr. Asquith, the Prime Minister, announced that any change in the price of sugar in the next few months is likely to be downward. If the struggle should be between cane and beet on equal terms then we have to aim at producing sugar at as cheap a rate as the best cane sugar countries i.e., Java and Cuba. This can only be done by the exercise of unremitting care and attention to all branches of the cane industry, the selection of canes, their cultivation and manufacture.

(Extracted by K. U. K. M.)

Notes.

As mentioned in our leading article of November issue the week preceding Christmas was a very busy time for the Agricultural Department in connection with the Madras Exhibition. While we are going to the press we understand that the hard work done by many of the members of the Department has been rewarded by a 'Certificate of Excellence' conferred on the Department of Agriculture. The Judges of whom none other than Sir Frederick Nicholson who has been associated with the agricultural improvement of the Presidency for nearly two decades and who can authoritatively talk on the subject has recorded excellent remarks appreciating the educative value and usefulness of the Exhibits. Departmental officers of the Agricultural College and Research Institute and the Northern, Southern and Central Divisions were very well represented on duty in the grounds. Among those present were Messrs. R. C. Wood, K. Rangachariar, W. McRae, R. Thomas, K. Ramasastrulu Naidu, D. Ananda Rao, J. Chelvaranga Raju T. V. Ramakrishna Ayyar, and D. Balakrishnamurthi. There were also numerous other non-gazetted members of the department on duty and as visitors. Six students of the College served as volunteers rendering service by way of helping the officers in arranging the exhibits and relieving men on duty at odd hours. We may therefore say that the credit earned by the Department is to be shared by all these people.

The beneficial effects of deep rooted crops are well known, specially in opening up the subsoil, making it more porous and thus aerating it. Red gram (*Cajanus indicus*) is one of the best examples as a natural soil aerator. The long tap root of this plant goes to a great depth in the soil and the lateral roots break up the soil in all directions, so that a system of tunnels is left which helps in ventilating the soil. The effect of this on the succeeding Tobacco crop is considered to be most beneficial. The

cultivation given during the growth of this crop also helps in aeration, while the organic matter added by its leaves and flowers also assists in the same direction. Red gram may therefore be considered as the subsoil plough of the ryot.—“Soil Ventilation.” D. A.

[This probably accounts for the practice obtaining among the florists of Tanjore of systematically growing one or two plants of Redgram by the side of every Jasmine cluster. (Ed).]

Improvement of saline lands:—There is a popular belief in Vizagapatam District that Vekisa wood (*Peterocarpus Marsupium*) improves saline lands. It is believed that fields slightly alkaline are considerably improved when worked with implements made of Vekisa wood. The saw-dust of Vekisa wood is very eagerly collected by owners of alkaline lands to improve their fields. When Vekisa wood was being sawn for building purposes on the Anakapalle Farm, one Dantuluri Sanyasi Raju Garu of Tummapala took a cartload of Vekisa saw dust and applied to a plot of one acre in 1914. On this land paddy used to die immediately after transplanting but in the year 1915 a fair crop of paddy was grown as a result of the application of Vekisa saw-dust.

A sample of the dust was taken by the Agricultural Chemist and a fair quantity was supplied to the Govt. Sugar-cane Expert for dressing an alkaline plot on the sugar-cane breeding station at Chettipaliam. A scientific explanation on the subject from the experts will be most interesting. D. B. K.

Indigo Industry in Vizagapatam District:—As a result of the great European conflagration the price of indigo dye has more than quadrupled itself and the benefits are monopolised by a very few people who had kept their factories going even when there was a lull in the industry. Thousands of factories were constructed in the district in the seventies and eighties of the last century

by the late Messrs. Arbuthnot & Co. and almost all of them are now in ruins. To bring them to order, a large investment is required and in addition to this, the factory people are required to supply seed for sowing to the ryots at a very low rate viz. Rs. 4 per bag of 164 lbs., whatever be its market rate. A bag of indigo seed, selling at Rs. 4 to 5 before the war is now being sold in Rajahmundry and Cocanada markets for over Rs. 40 irrespective of the quality of the seed. Vizagapatam District depends for its supply of indigo seed on the Godavari lankas where for want of proper demand, seed 5 or 6 years old was lying idle. Owing to the present rise in the price of the dye, merchants poured in from the southern and ceded districts, purchased the last traces of the seed and exhausted all the oldest stock without even caring for the proper germination of the seed. Large quantities were purchased by merchants from Nandyal side to adulterate their's and to pass it on as Nandyal seed to the southern districts.

About 100 bags of seed purchased last year—on the Anakapalli Farm—for distribution to the ryots and of poor germination capacity was very eagerly purchased by ryots from Guntur District. They were supplied at the cost price of Rs. 6-8-0 per bag although merchants offered higher prices. But they were warned to use a higher seed rate as the seed is of poor germination capacity. The sowing season is fast approaching and enough seed to supply the demand is not available. D. B. K.

At one of the weekly excursions made, our attention was drawn to an interesting method of well-boring in Vellaikinar, a village situated about 8 miles to the north of Coimbatore. Although it was originally introduced here some ten years ago, the practice has now established itself fairly well.

The tools used in the operation are quite simple but by no means inefficient. They are only a few crowbars and a spansel. The crowbars used are steel tipped, about two inches in diameter, varying from

6 to 40 cubits in length and can be bought at 4 cubits per rupee. The spansel has a valve at the bottom end, capable of opening upwards only. To the top end of the spansel are attached a number of iron rods which are folded over one another when not in use. The spansel with the rods costs about Rs. 10.

Boreholes are put from the bottom of all existing wells. In the dry season when there is very little water in the well they select a place at random for boring. With a short crowbar a set of 4 men busy themselves in getting down the crowbar straight. Then the crowbar is removed and the spansel is introduced to remove the mud. Owing to the pressure exerted by the persons the mud pushes the valve up and enters the cylinder. When this is full, it is lifted up and emptied of its contents by inversion. As the hole gets deeper and deeper, longer crowbars are used and the rods of the spansel are unfolded as required. Two sets of persons will be engaged now, one set standing on a platform erected and the other at the bottom of the well. The latter see that the crowbar always goes straight and that it is given a proper twist lest it should stick in the mud. The free end of the iron rod is tied to a string which passes over a pulley suspended to a tripod erected for the purpose. The operation is continued on till the hole reaches the water under pressure, which gushes out with a tremendous force. But it may be observed that failures are quite common as the bore-holes are put at random. It is only by chance that the bore reaches the water bearing stratum in the first attempt. Many fruitless borings have to be done before they hit at the right place. But in Vellaikinar the water bearing stratum is one of the fissured rocks and there is usually a good supply of subterranean water.

When it is found that the hole has entered the spring the crowbar is removed and a bamboo pipe 3 or 4 cubits long and open at both ends is introduced. This precaution is necessary as otherwise the hole will be blocked up with mud from the bottom of the well. This finishes the operation of well boring.

In Vellaikinar, the whole operation is often let on contract. The rate varies with the hardness of the rocks below and ranges from Rs. 1

to Rs. 2 per cubit. Usually a successful boring costs about Rs. 50 to 60 for a depth of 40 feet.

The advantages in this set of tools are that they are cheap and simple not requiring great mechanical skill. The boring itself does not cost much and the operation can be done by ryots themselves in times of drought. The well need not be deepened and consequently the lift is not made higher. A continuous supply of water can be ensured even if the season turns out to be dry. V. R.

Agricultural Improvement in Malabar :—I have for sometime past been taking some interest in the improvement of South Indian Agriculture and maintaining a farm of my own in which I have tried some of the new methods and achieved some measure of success and I am still pursuing it. Recently I had occasion to visit two private farms in the centre of Tellicherry which showed me the wonderful results of economic transplantation. One is in Narangapuram—the cultivation extending about 8 acres and maintained by Pattath Krishna Marar. It has been in existence for the last two years and the method of economic transplantation has been tried here with wonderful results with the Taliparamba Farm seeds.

The local seedrate before the adoption of the new method was 400 Madras Measures. This has been reduced to 200 M. M. (both per 8 acres of cultivation). This is in the ratio of 50 to 25 M. M. an acre i. e., where the cultivator used to sow 50 M. M. in the nursery to transplant one acre formerly, he now sows 25 M. M. to transplant the same area i. e., a reduction of 25 M. M. of seed per acre—the seed used being selected seed in the latter case (Taliparamba Farm seed).

The cultivator says that he used to get an average of about 500 M. M.; but for the last two years, he says, referring to the accounts kept by him, he was getting about 750 to 800 per acre.

This is a clear extra outturn of 250 Madras Measure per acre. The land has been treated with only ordinary ploughings, manuring etc. One can gather that the result is evidently due to the selected seed and economic transplanting. I would remark here that the one defect that I found was, that he was not careful with regard to the weeds, which I suggested could be remedied by constant ploughings, commencing soon after harvest.

The Taliparamba Farm Manager who was accompanying us throughout, pointed out that with greater attention being placed to tilth and proper application of manure in the usual time and if the system of seed selection is annually carried out with care, the seedrate could gradually be brought to the standard of the rate of the Farm—i. e., 10 M. M. per acre.

The other land we visited is the "Kaivatta" land in Chalil also in Tellicherry. The improvement made here is similar to that at Narangapuram (Tiruvangad); but with this difference that the seedrate here has been reduced from 40 (local) to 20 (selected) as the land here is more fertile than at Narangapuram; and it is a matter for extreme satisfaction to know from conversation with the tenants over here that they use less seed, have faith and belief in what the Manager was advising them to adopt and that they hope to be able to reduce the seed rate still further in the course of another couple of years.

The results achieved in the above two Farms prove beyond doubt the wonderful effects of economic transplantation. To encourage their adoption on a larger scale, what is wanted is men who will educate and convince people by encouraging the starting of demonstration plots in suitable localities in different centres of the District. The publication of the results achieved, by those who have tried and succeeded, will be of real benefit in educating the public and encouraging them in the adoption of improved methods of cultivation. V. K. K. N.

At the Delta villages in the Ramachandrapur Taluk of the Godaveri District visited in the last week of December, there were to be met some patches of Sunnhemp about 3 feet high with a good uniform stand. Sunnhemp is regularly grown in these parts by a large number of ryots chiefly with the object of providing nourishing fodder for their cattle. A small variety of the seed is sown in the standing crop of paddy a week to ten days before the harvest of paddy in November when there is sufficient moisture in the land, the seed rate being 3 Kunchams or $7\frac{1}{2}$ Madras Measures per acre. In about a month after sowing, the crop will be about 3 feet high and from this time forward the required quantity of it is cut daily and fed to cattle in a green state for about a month. At two months' old, it will be about 6 feet high and fully in flower when the whole crop is cut and allowed to dry for about a week and then bundled and stacked to be used as dry fodder. While stacking, care is taken to provide a bedding of straw, about 6 feet thick, and a good covering of the same material to prevent any rain water getting into the stack and spoiling the fodder. It is a pleasing sight to see that the Sunnhemp is cut into small pieces and given to young and milch cattle in baskets to prevent wastage. This leads one to think that Sunnhemp might prove a valuable fodder crop when rotated with Cholan under regular irrigation. As cattle seem to possess an instinct of not overloading their stomachs with Sunnhemp, either green or dry, they can be safely fed with as much as they can eat of it in addition to the staple fodder. Converted into hay and cut into chaff, it must form a valuable adjunct to the existing fodders.

A. R. R.

Sugarcane tops for dairy cattle.

Cane tops are the most readily available green fodder on certain estates in Barbadoes and would seem to be a food eminently suited to the production of milk and butter. It is found, however, that a diet of sugarcane tops result in the production of a soft

butter without grain. This is an undesirable quality in butter because such butter is more difficult to work and to be free from butter-milk. K. K. R. (Agricultural news).

* * * *

An interesting matter which I gathered from the ryots of Velladu Village is that the seeds of 'Mullukiluvai' (*Balsamodendron Beryi*) which are available from Pankuni (March-April) are used for feeding cattle mixed with cotton seed. The seeds are picked from the trees when they are fairly ripe, ground, and mixed with cotton seed and fed to cattle. This is said to be a good nourishing food for working cattle and in milch cattle is said to increase the flow of milk. The practice is said to have been in vogue only for the last 2 or 3 years. In years of scarcity of fodder and straw, it is probable that the ryots had to use all their resources and invent new methods. It was under such circumstances that the use of this was suggested by some one in the village and from that time, the seed is being used with great advantage. W. R.

* * * *

The Superintendent of the Madras Agri. Horticultural Society's Garden states in his report that he found that a majority of sandal wood (*Santalum album*) seedlings when transplanted failed to strike root. This high percentage of death of plants was put down to defective potting and hurting the roots; but he has recently noted that the plant is a root parasite obtaining great deal of its nourishment from the roots of other trees so that in transplanting sandal wood tree seedlings a very large ball of earth attached to the roots must be taken up in addition to being careful not to hurt the tap root. In planting the tree it should be placed where the roots can attach themselves to the roots of shrubs growing near by. Most trees object to and suffer from the tangling of the roots of other trees and shrubs, but in the case of

sandalwood tree such a tangle is necessary to its parasitic root system. K. U. K. M.

Deterioration of cane after cutting:—Canes which are topped high deteriorate sooner than cane cut lower. Not only does high topping lower the purity, but also after cane is cut, it begins to deteriorate, the inversion starting in the green top. According to Browne (Lou: Bull No. 91) the growing parts of the cane contain an inverting enzyme which diffuses down from the green top, into the body of the cane. * * * The tendency to deteriorate is naturally much more marked at the higher temperatures, much depends on the maximum and minimum temperature each day, on the rainfall and probably on the variety of the cane—deterioration of cut cane is much slower in Louisiana than in Java. In the deteriorated cases of canes there was an increase in the percentages of gums and of solids not sugar. * * *

In no case did cut cane deteriorate inside of ten to fifteen days in Louisiana. (Louisiana Planter). K. K. R.

Economic value of Sun-flower. Oil is of great value. Besides being used in some parts for table purposes, it is employed in the manufacture of paint (especially for greens and blues); it also makes soap of great softness. It burns well. The seed is a valuable food for poultry. The seed, shelled and ground, makes very fine sweet flour for bread; if roasted and ground it forms a substitute for coffee. The marc is superior to linseed-cake for fattening cattle. The leaves may be used as fodder either fresh or dry. The flowers are useful in providing honey. By treating the stem of the plant like that of the European flax a very fine fibre, nearly as fine as silk, is produced. Few economic plants, indeed, are more valuable than the sunflower, and it would appear to deserve greater attention for commercial purposes in this part of the Empire. (Journal of Agriculture, New Zealand.) K. U. K. M.

Estate Notes.

War Fund Entertainment:—A dramatic performance in aid of the War Fund, was, on the 6th December 1915, given by the students of the College. Our thanks are due to our many friends, in Coimbatore and elsewhere, who so generously assisted to make the show a financial success. The students presented two dramas, one in English, Goldsmith's "The Good Natured man," and the second in Tamil, "Vasanthika." It would be invidious to attempt to draw comparisons, both were excellent and showed evidence of considerable care and industry in their presentation. A new departure was the fitting up of the stage across the southern end of the main hall down stairs. This was a great success, the stage being when lifted up, a perfect picture, but the Hall was inclined to be draughty and became very cold at night.

The acting was much appreciated, and M. R. Ry. Vittal Rao, S. Kuppuswami, Sitharama Ayyar, Srinivasachari and Dharmalinga Mudaliar especially merited the applause they received for their clever impersonations, while Avadinayakam Pillai as the clown kept the house in roars of laughter whenever he appeared.

Our heartfelt thanks are due to Messrs. Wood and Rajagopala Ayyar for the great pains they took in coaching up the students in English and Tamil plays respectively and to Mrs. Harrison for the trouble she took in personally supervising the making of the costumes for the English play.

The accounts have been kindly audited by M. R. Ry. U. V. Venkatasubbayyah, the account clerk in the Principal's Office. They show total receipts Rs 424-3-11 made up of the sale of tickets and subscriptions from friends. As the expenses only amounted to Rs. 124-3-11, a sum of Rs. 300/- has been obtained, which has been remitted to the Coimbatore Ladies War Fund.

An unwelcome visitor:—We were congratulating ourselves not long ago that plague which used to be our annual visitor to Coimbatore had not made its appearance the last two years, but as luck would have it, Coimbatore showed symptoms of recrudescence some months ago, but we in the estate had the good fortune of being free from it till the College closed for Christmas vacation. The College opened again on the 6th of January but unfortunately a few rat falls were reported on the farm, and it falls to our lot to record that plague claimed two victims from the estate—a cooly woman and the farm clerk, a christian young man who was recently married. Such a thing had never before occurred in the history of the College. We were possibly too sanguine of our immunity but Providence has willed it otherwise. We extend our heartiest sympathy to the poor young widow and relations that Sundarsanam has left behind him. Thanks to the stringent and speedy measures taken by the Principal as Honorary Assistant Plague Officer, we are thankful to say that no further cases have occurred and let us hope that we have seen the end of it. The whole estate was speedily evacuated, the Farm office, Stores and Veterinary Hospital were provided with accommodation in tents and officers whose presence was essential in the immediate vicinity of the Farm were located in tents and huts erected near by.

Health camps were at once erected in the northern end of the Farm, and it was most fortunate that the Principal was able to obtain the vacant student quarters at the Forest College next to us where all the married men with their families were accommodated. We might call this a God-send as otherwise the women and children would have had to put up with a deal of privation and suffering during the cold nights of early January. Owing to this dislocation of work it was decided by the College Board that the College should be closed and students were sent away immediately as several of them expressed anxiety of being

here. The third and first year students were sent away and the 2nd year batch which was on tour with the Assistant Principal was broken up at the end of the tour.

The European officers with their families and some Indian officers set a good example by inoculating themselves for whom a special Assistant Surgeon was sent. A second time we were fortunate to obtain the services of another officer to do inoculation whose presence was fully taken advantage of by every body in the estate. It was a gratifying sight to see illiterate coolies thronging and offering themselves voluntarily to be inoculated whereas it is customary in towns to bribe the people for this purpose.

Disinfection of the evacuated locality was taken on hand on the 20th January under the immediate supervision of the Sanitary Inspector whose energies have been taxed to the full. The work is nearly complete and the Special Plague Officer in charge has permitted the occupation of quarters by those who have been inoculated. The Principal had to go away into camp on the 22nd and in his absence the work has devolved upon the Assistant Principal. We have now a patrol of policemen both day and night watching the evacuated buildings.

It is impossible to speak too highly of the way in which this most arduous and responsible task was grappled by Mr. Wood. He spared no pains in seeing to the comfort and convenience of the residents in the estate, and although the plague regulations had to be rigorously enforced, they were always done with a consideration that is due of a father to his children. We hope that by the time he returns he would be freed from all anxiety on this score.

We take this opportunity of offering our apologies to our readers. The January issue of the Journal is very much belated but we hope they will take that this dislocation of our work owing

to the presence of this most unwelcome visitor in our midst as a sufficient excuse for the delay.

A Narbudha reaping machine was for the first time given a trial on the Central Farm this harvest season. It was worked by two pairs of fast-going animals. The machine has to be drawn fast to get the best work done as a slow movement of the knife causes the standing crop to bend and thus escape being cut. It can cover $\frac{3}{4}$ to one acre an hour according to the crop cut and size of the field to admit of its free movements. Fodder crop of cholam was cut at an acre an hour. Thenai crop was the next it could tackle best. The difficulty in this case was that some of the ear heads of the crop were very roughly handled so that it made the subsequent gathering difficult. Fodder Cumbu grown thick could not be cut more than $\frac{3}{4}$ an acre an hour in as much as the crop clogged the knife and stopped the working of the machine at times. A grain crop of cholam can be well dealt with if the plants are not too thick to be accommodated within the angles of the cutting blade.

From the 6th to 10th January Class II students were taken on tour by the Assistant Principal and the Special Assistant. They visited Bezwada, Guntur, Nandyal and Bangalore. Class III was taken on a tour to the Telugu districts of Bellary, Kurnool, Godaveri and Vizagapatam by the Principal. The students joined the Principal at Hagari on the 24th January and on closing the tour at Anakapalle, they returned to their homes as the College is yet closed on account of plague.

Departmental Notes.

Mr. V. S. Narayanaswami Ayyar has been permanently posted to the Central Farm as Director and that Coimbatore should be kept in full strength.

We are glad to understand that Mr. K. T. Alwa L. Ag. the first Agricultural Medalist of the Coimbatore College has been promoted to be a 2nd grade manager from 1st January. Here we may also state that Mr. Alwa is the first of the Coimbatore graduates to get a promotion.

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N. B.—Contributors are requested to send in their contributions written legibly in ink on one side of the paper only.—Editor.

Editorial Notes.

There seems to be a misconception in some quarters with regard to the enhancement of the subscription of the Journal to two rupees. We regret very much that we did not make it very clear at the outset in the Journal, although it was fully explained at the last General body meeting that we were sustaining a serious loss in running the Journal at one rupee per year and that it can be made self supporting only if we raise the subscription to two rupees. In the present circumstances, however much we would wish otherwise, we find it impossible to increase the size of the Journal, unless we get many more subscribers and are assured of a hearty support of our readers in the shape of contributions than they had been giving hitherto.

We have much pleasure in publishing elsewhere a valuable contribution on Agricultural education by one of our contributors. It is unfortunate, however, that reference to the main ideal which marked the speech of the Hon'ble member has been overlooked. We cannot do better than quote his own words: "Our aim must be for all time to fit Indians for carrying on of the work at present concentrated in the narrow confines of the Imperial Agricultural service. For such purpose and in course of time we may hope as I have hinted that Indians not only of the literary castes, but of the agricultural classes also, will take up this line. Colleges affiliated to the various Indian Universities seem to me to be essential. It may be that there is not room for many such University Colleges yet, but they will have to come." It is our earnest hope that those who have the moulding of the destinies of the Agricultural education of the country in their hands will do all in their power to see to the consummation of the ideal laid before them in the striking and sympathetic address of the Hon'ble Mr. Claude Hill.

We are glad to learn that the Bombay University considers that Agriculture has gained sufficient prominence as a subject for special study in India and is seriously thinking of instituting a degree of 'Master of Agriculture.' It is hoped that our University will follow the lead.

We would draw the earnest attention of the student readers of the Journal to a very thoughtful address recently delivered by Mr. Gandhi to students in Madras. We regret we have no space to comment on the many interesting points raised in the lecture, but would be content with emphasising one or two only. According to Mr. Gandhi character building is the only need of India at the present day. However great may be a work that has been performed, without character backing it, it will not prosper. He then

referred to the failing of insincerity in the nation. We are often called the French of the East, meaning that we are polite, but unfortunately this very politeness makes us insincere. We often mean one thing and say another; as students we ought rather to train ourselves to say the honest truth, however blunt it may be than sacrifice it in the hope of saying something that would please our teachers.

Agriculture and Education.

The relations which should exist between the two great Departments which are found in most civilised states, that which concerns itself with education and that which is charged with the investigation of Agricultural problems and the proportion of improved methods of agriculture, have always been rather an open question. The history of Saidapet in our own Province, shows how the pendulum has swung first one way and then the other. We find the Educational and the Agricultural Department each at times controlled that Institution, while for a considerable time the problem was solved by a system of joint control. It is fitting therefore that the subject of agricultural education should receive special attention from those concerned, and certainly there has in the past, been no lack of discussion, marked at times by considerable misconception and lack of a sense of proportion. The matter formed one of the most important subjects for discussion at the meeting of the Board of Agriculture at Coimbatore in December 1913, when it was thoroughly discussed, and the way cleared to a truer conception of the many problems interwoven with it. The matter was however considered of sufficient importance to warrant further discussion this year, and an informal meeting was convened by the Hon. Member Mr. Claude Hill, on the 4th and 5th February at Pusa, immediately before the meeting of the Board of Agriculture.

The full report of this meeting and the general conclusions arrived at, are not yet before the public, and it would be premature to speculate on what lines these resolutions will be. The general scope of the discussions may however be judged, from the Hon. Member's opening speech which was fully reported in the papers.

Mr. Hill specified five directions in which the activities of the Department of Agriculture should proceed.

- (a) Scientific investigation.
- (b) Courses of instruction to fit Indians to help in such investigations.
- (c) Instruction in practical agriculture.
- (d) A course of instruction to train Agricultural instructors and demonstrators to work in the Department.
- (e) Instruction for Agriculturists.

That this classification is on the whole sound, no one will deny. The first two, and the last but one are already being energetically pushed in our own College, and nothing further need be said about them.

As for the other two, they need some elucidation, for it is a very open question as to how the instruction to agriculturists can be given, nor is it quite clear what is meant by (c) instruction in practical agriculture. We are all agreed that some instruction must be given to agriculturists, and indeed a subject which is very closely allied to this, has taken a prominent place at every meeting of the Board of Agriculture for some years past, namely, "The best means of bringing improved methods to the notice of the cultivator."

It is or should be clear that this teaching cannot be imparted unless there is subject matter to impart, though it is equally

evident that this axiom is frequently forgotten by those who clamour about the necessity for higher education in Agriculture. That is to say teaching must be largely confined to imparting simple improvements which have been carefully tested, and whose value has been carefully estimated. This is being done in all provinces, by very different methods—by leaflets, by practical demonstration either on Government or hired land, by peripatetic instructors, by the vernacular and Anglo-Indian Press, with the help of the Revenue Department, by means of Exhibitions and other similar methods, which though they may not have reached the standard of 'hustle' which American demonstration methods often suggest, yet are in a quiet and methodical way, having a great effect in educating the agriculturist.

Whether anything more than this is at present needed, is uncertain. The value of education, if the demand for it is to spread rapidly, must be self-evident, and it is perhaps too early to say that the advantage of a vocational education in agriculture is at present very marked, though undoubtedly as knowledge of agricultural methods and experimental trial of suggested improvements increase, such a vocational training will hold out better and better prospects of being profitable. But all this progress requires staff, and where are men to be obtained, save from the Colleges? And so the argument ends in a circle; the Colleges are waiting, for the spread of district work, to give them the materials for a really sound vocational training in agriculture, while the Districts wait on the Colleges to give them the necessary trained men for the prosecution of their various activities.

A judicious policy will endeavour to keep these both going at once, concentrating in particular districts where work can be carried on most rapidly relatively to the staff engaged.

These facts should be borne in mind when approaching this problem of Agricultural Education. The Educational Expert

may find himself bewildered by such an attitude: he says in effect "here are schools, here are teachers, here are children to be taught. They must be taught something: why not teach them agriculture?." It is perhaps natural, but it is wrong, and can do no good, and if the results of the discussion at this Conference, serve to emphasize the impossibility of teaching Agriculture except under very special circumstances in Primary or even Secondary Schools, it will have justified its existence.

Fungi chiefly with relation to Plant Diseases.*

Fortunately in a tropical land like India, this subject requires but little introduction, for all are familiar with fungi in some of their aspects. Fungi are low forms of plant life. All being devoid of chlorophyll, none of them are green. Chlorophyll, as you know, is the green substance in the leaves of plants by means of which, in the presence of sun-light, they can take the salt-solutions absorbed from the soil by the roots and the gases of the air and from them can manufacture food to build up their own structure. Plants that do not contain chlorophyll are unable to do this and therefore must make use of nutriment already manufactured by the plants possessing the requisite chlorophyll. Fungi, then, cannot make their own food from simple substances but are entirely dependent on other plants or on animals. They may get it either out of living plants or from dead and decaying vegetation. In the latter case, where the nourishment is obtained from leaf-mould, cow-dung, bread, wood and such like substances, fungi really do useful work in decomposing the dead matter and rendering it again available as plant food although when they attack bread or timber in houses they are looked on from an economic point of view as destructive agents. In the first case, the fungi which derive their food directly from living plants are called parasites or parasitic fungi while the plants on which they live get the name of host-plants.

*Extracted from paper read by W. McRae Esq., M. A., B. Sc., F. L. S., at the Madras Exhibition on 5th January 1916 and illustrated by lantern slides.

When a green plant becomes infected by a parasitic fungus, it has additional work to perform having to provide food for itself and also for its self-invited guest. In some instances it is quite capable of doing this and remains unharmed but in other cases the extra work is beyond its power and it succumbs. The fungus may devour all the food destined for its host-plant's necessary functions or it may derange the starch-making machinery of the leaves and the host-plant dies of starvation. It may stop up the water-conducting tubes of the stem and the host-plant dies of thirst or by weaving a covering completely over the leaves it may prevent air from getting access to the tissues and the host-plant dies of suffocation.

Parasitic fungi, then, are the renegades of the vegetable world. They are all dependents. Many are thieves, stealing openly for all the world to see or secretly in dark places. Some are murderers and fratricides bringing lingering or sudden death. They have given an evil reputation to the whole group of fungi, in some cases well merited but in others quite undeserved, for fungi are not wholly bad. Some have redeeming features, for instance a few are edible; many, notably those that live in the soil, transform the dead matter into humus which forms a rich store of food for our crop-plants. And even the worst of them have developed a degree of resourcefulness that gives cause for admiration. As examples of the diseases caused by parasitic fungi, leaf-spot in tumeric, fruit spot of chillies, long smut on cholam, ephellis on paddy, red-rot of sugarcane, canker in white Babul may be mentioned as familiarly found in the Presidency.

These six examples show the appearance of diseased plants and now we wish to know what the fungi themselves are like. We shall begin with a fungus that is well known to every one and is large enough to be seen by the naked eye, even though it does not cause disease, viz., an edible mushroom so common in grassy fields and by hedgerows during the monsoon. It consists of two main parts; one is an umbrella-like structure and is above ground, while the other consists of a mass of threads and is below ground. These two parts have different functions to perform. The umbrella-like part is the fruit and contains the

seeds or spores. If we lay a fresh mushroom from which the stalk has been cut on a sheet of paper, in an hour or two we shall see radiating lines of a light brown powder on the paper. The powder consists of little round things. Each one is a seed, which, if it gets into suitable soil with plenty of organic matter, the right amount of moisture and a suitable temperature, will germinate and grow into another mushroom plant. The mass of threads in the soil composes the rest of the fungus plant. They bore among the dead roots, leaves and stems of plants in the soil and absorb food from them. This is the vegetative part of the fungus. All fungi have these two parts, a more or less complex fruit and a simple vegetative body composed of threads.

Different fungi vary greatly in the form and size of the fruit body while the absorbing part, the threads, is comparatively simple. The complexity of the one part and the simplicity of the other are correlated with the function which each part has to perform. The fruit, or spore-bearing part is pushed up into the air above the stuff on which the fungus is growing in order that the seeds or spores may have a better chance of being blown or carried away to other places. Hence this is the part of the fungus we generally see. The thread-like part of the fungus absorbs food and is embedded in the stuff on which the fungus grows whether it be soil, bread, chillie fruit, cumbu leaves or the branches or roots of trees. Hence this part of the fungus we seldom see, unless we look carefully for it.

Reproduction. The fungi do not produce seeds in the sense in which we use the term when we speak of cholam seed, mango seed or cotton seed but they produce exceedingly small bodies which answer the same purpose and these we call spores. Spores originate in two ways, either as sexual spores in which two germs unite and form a new individual or as non-sexual spores in which a part of the body of the fungus is separated off as a spore.

The Sexual method of reproduction involves the fusion of two parts and thus gives the new fungus-plant the advantages of a double parentage. The sexual spores are usually resting spores i. e., they remain dormant for a time and germinate only after a period of rest.

They serve to carry the fungus over unfavourable seasons and thus perpetuate its existence from year to year.

By the non-sexual method of reproduction a small fragment of a thread is cut off and this may be accomplished in many ways.

1. Spores may be produced at the ends of simple or branched stalks singly or in chains.
2. They may be produced at the ends of simple or branched stalks inside small cases or boxes.
3. They may be produced in little sacks embedded in the tissue of the host plant.
4. They may be produced in little bags inside a flask-shaped cavity, the number of spores in each bag being constant usually 8, sometimes 4 but always constant for one and the same fungus. These are but a few of the arrangements according to which spores are produced by fungi.

The spores themselves vary much in size, in shape and in ornamentation of their surfaces. Some spores of one of the fungi causing rust on wheat are so small that 5,000 of them placed in a line touching one another would measure only one inch. While if those of another rust on a grass were placed end to end in the same way only 300 of them would occupy an inch. They show great diversity of form varying from the simple sphere to the spiral and the many-celled spore. The ornamentation on the spores is also diversified and the roughnesses, hairs and hooks may all serve to attach the spore more readily to leaves or branches or wherever their suitable environment may be. Some spores have long cilia which lash backwards and forwards and propel the spore through drops of water. Naturally these fungi are water-loving plants and grow best either submerged in water or in those places where the monsoon is heavy. e. g., the spores of the bud-rot fungus on palms and of the Mahali fungus on arecanuts are swimming spores though, of course, each of these fungi has another type of spore as well. As a rule there is one kind of spore for quick distribution from host-plant to host-plant during the growing season and another kind of spore (a resting spore) made to lie dormant during

that part of the year when the host-plant is not growing. Certain fungi have carried this development of different types of spores to a remarkable extent as for example in one of the rust fungi where there are four different kinds of spore each for a particular function in the life history of the fungus besides a fifth kind of spore that has quite lost the power to perform its function.

Some fungi on the other hand can reproduce themselves without forming spores at all. A few threads of the fungus weave themselves tightly into a little ball which becomes separated from the fungus plant and, later on, when it gets into a suitable place, the threads grow again. This is a lazy method of reproduction but it is quite effective as is seen in the damage done to potatoes by such a fungus.

Dissemination of Spores. Just as the higher plants utilize many agencies for the purpose of distributing their seeds over as wide an area as possible so the fungi make use of these same agencies for the dissemination of their spores. For the majority of fungi the wind is the agent for carrying spores away and enabling them to reach a suitable situation. Thus it is, that most fungi produce their fruit-bodies exposed to the air, e. g., the mushroom raises its umbrella-like fruiting body into the air and at maturity sheds its spores when they can be caught by light puffs of wind and carried off. The spores of smut on cholam are shaken out into the wind by the movement of the host plants. Their position in the ear-head is of advantage as the height gives them an increased radius of distribution. Such fungi usually produce spores in enormous numbers. Hundreds of thousands usually fail to develop where one or two find suitable conditions and give rise to mature plants. This is because the spores being so very minute cannot contain a great deal of nourishment and cannot therefore withstand unfavourable conditions of germination for any length of time. These fungi make up for the danger of failure by a prodigal formation of spores. Man is also an important agent in the distribution of spores. During his commercial transactions in moving commodities, shipping grain, and in introducing plants to other countries, fungi are also introduced and spread over great areas. e. g., rust spores are

spread in straw packing, and smut spores on grain. In a more restricted area spores and diseased plants are carried from field to field adhering to cart wheels, implements, animals and clothing and are even borne along in the water channels. Insects also distribute spores very successfully. An effective device has been invented by the fungus that causes sweet-ear disease of cholam. In the young grain a mass of much branched threads produces numerous spores and also a sugary solution which attracts insects. As the insects sip the sweet liquid the spores become attached to their bodies and are carried off to other flowers thus rapidly spreading the disease.

The fungi that have swimming spores are dependent for their distribution on water either in streams or in rain running over the surface of the host-plant. These are but a few of the many ingenious ways which individual fungi have discovered for dissemination of their spores in order to secure the perpetuation of their kind.

Germination of Spores. When a spore of a fungus gets into a moist warm place, it sends out a thin thread and, if there is a sufficiency of suitable food, the thread branches and grows into a full fungus-plant which again produces spores. If the fungus is a parasitic one and the spore rests on a suitable part of the host-plant the thread may either remain on the outside of the host-plant or go inside it. In the former case, the fungus always remains outside and only sends little sucking tubes into the outer cells of the host-plant to get nourishment e. g., the mildews, a familiar example of which is the mildew on tobacco which causes so much loss. Most parasitic fungi, however, penetrate the tissues of the host-plant. The thread that grows from the spore goes in, either through one of the small breathing pores, or through an open wound or it actually bores in by secreting a ferment which dissolves the tissue of the host-plant and makes a way for the advancing threads of the fungus. Once inside, the threads of the fungus ramify between the cells of the host-plant or actually penetrate them and live inside. Some fungi live in a happy symbiotic relationship with their hosts. The host may simply supply food to the fungus

without detriment to itself, or the fungus, especially some root fungi, may even help the host to absorb food material from the soil. On the other hand, parasitic fungi may kill the cells of the host-plant either locally or to such a degree as to destroy the whole of the infected plant. Most of these fungi, after a period of vigorous growth, come to the surface and again produce spores for their further increase.

The changes in the host plant. Parasitic fungi often cause abnormal growths of their host-plants and it is by these, that we usually recognise the disease.

A few cells only may be infected and minute leaf-spots may be formed. If such spots are numerous and in those instances where the whole leaf is infected great harm may be caused to the plant by interference with the starch-making processes of the leaves.

The fungus may cause various organs of the plant to rot e. g., the fruit-rot of chillies and of areca-nuts and the bud-rot of palms.

A fungus, attacking coconut and palmyra palms softens and rots the young leaves in the crown and ultimately kills the bud. This is a deadly form of disease in the case of those two palms because each tree has only one bud and after it is destroyed the tree can never produce a single new leaf. In a year or two it is quite dead and reduced to a bare pole.

The fruits of the host plant may be entirely replaced by the fungus e. g., in the short smut of cholam where instead of a ripe seed we find a mass of black powder which is but the spores of the smut fungus. This fungus has an interesting life history. It gains entrance to the cholam plant when the latter is in the seedling stage and never at any other time. It remains near the growing point keeping pace with its growth without affecting it detrimentally until the grain is beginning to fill. Then the fungus penetrates all the grain tissues, appropriates the food material and forms its smut spores.

On the branch of a tree a boil or canker may be formed which remains open for years. The tree produces healthy tissues to try to

heal up the open sore but the fungus as persistently destroys the tissue. Some of these cankers reach huge dimensions e. g., on the white babul the cankered surface may extend to five feet.

Control measures for the prevention of fungus diseases may be applied along one or more different lines, i. e., good cultivation, seed selection, general sanitation, growing disease-resistant varieties and application of chemicals that are fungicides.

The first and most important thing to do, is to maintain the host-plant, in a thoroughly favourable environment and so keep it vigorous and healthy. This is done by *good cultivation*.

2. *Seed selection.* Then we must choose seed for sowing from healthy plants only; and in most cases this is the easiest and most natural means of controlling a disease e. g., the fruit disease of beans and the fruit-rot of chillies are carried over from crop to crop by diseased seed. Diseased pods almost always contain diseased seed even though no spot is visible on the seed. Thus in selecting seed for sowing either of these crops we should choose only those from pods that have no discolouration on their surfaces and discard all from discoloured pods. Cuttings and tubers taken from diseased plants should not be used for propagation because they will only reproduce the disease e. g., every ryot who cultivates sugarcane is familiar with the red-rot that causes so much loss. The disease is carried on from crop to crop by planting cuttings or setts from affected plants. Any cane with the characteristic red colouration should not be used for planting the new crop.

3. *General sanitation.* It is well known that some diseases live over the dry weather in fallen leaves or fruits or dead branches. The destruction of such diseased material is an important means of keeping a disease from spreading. Sometimes whole plants should be destroyed, at others only infected parts need be. To burn the infected material is the safest way of rendering it innocuous but this may be impracticable, then it should be buried in trenches to a sufficient depth. By doing this we lessen the number of spores and so reduce

the chances by which the fungus causing disease may infect the plants of the new crop.

4. *Growing resistant varieties.* Just as it is possible to select or develop varieties which produce improved fruits or grains so it is possible to secure varieties resistant to disease. The individuals of a variety or the varieties of a species are not always attacked to the same extent by any given parasitic fungus. Some individuals or varieties, often those of best quality, are always affected, others only occasionally. By patient unremitting labour these resistant plants may be selected and bred season after season till a definite variety is produced which combines the advantages of superior quality with resistance to disease. This method can be applied properly only by a skilled plant-breeder. In northern India this has been done successfully for wheat. There a variety of wheat quite suitable for those purposes for which wheat is used, has been produced which is resistant to the rust-fungus that causes such immense loss in this crop.

5. *Application of fungicides.* A fungicide is a substance that will kill or prevent the growth of a fungus or the germination of its spores. It must be strong enough to destroy or hold in check the injurious fungus but not enough to harm the host-plant nor the human beings or the animals that may use the plants as food. Fungicides are applied usually either to the seed or to the growing plant. In the former case the intention is to destroy spores attached to the seed that would germinate at the same time as the seed and infect the seedlings e. g., cholam seed from a crop affected with smut is steeped in a weak solution of copper sulphate. This kills the smut spores adhering to the seed and the seedlings are protected. After the seedling stage is passed this smut cannot infect a cholam plant. During this season in the Nandyal and Kurnool districts, seed for 17,000 acres of cholam was treated so with good results.

When a fungicide is applied to a healthy plant, the latter receives a coating of fungicide in order to prevent the germination of spores that may subsequently fall on it e. g., on the West coast arecanuts are subject to a fruit-rot called Mahali that causes immense loss during the

monsoon. If the nuts are sprayed with a mixture of lime and copper sulphate they get complete protection. Spores landing on nuts thus covered do not germinate. This year the bunches of nuts on 40,000 trees in Malabar were sprayed with excellent results. This particular fungicide is called Bordeaux Mixture. It is one of the oldest and best medicines and is used more extensively than any other. It derives its name from Bordeaux in France where it was first used on grape vines in order to make petty thieves think the grapes were poisoned. It was noticed that vines so treated were less affected by the dreaded vine mildew. It is a mixture of copper sulphate, lime and water. Many other fungicides such as formalin, corrosive sublimate and sulphur are utilised to combat specific diseases.

In order to get an even coating of the fungicide on a plant some kind of spraying machine is required. The small sprayer used by the people in Malabar to spray arecanuts is typical.

It is usually necessary to combine two or more of these ways of combating disease and it is always well to have the co-operation of one's neighbours. It is not of much use getting one's own crops free from disease if they are liable to be infected from surrounding fields. Generally it is not an easy matter to get a disease under control. It requires patient and persevering effort but the result well repays the trouble.

The treatment of some diseases presents particular difficulties to be overcome. The mildew of tobacco can be easily and effectively kept under control by dusting sulphur on the leaves but there is a fatal objection to this remedy in that the least trace of sulphur in the cured tobacco is intolerable both to the man who chews and to the smoker. Sulphur then is ruled out as a remedy and so are other chemicals. What then can be done to prevent loss from this fungus? The Mildew fungus hates light and fresh air and loves a moist still atmosphere. By planting the tobacco plants wider apart and attending carefully to irrigation the plants are in a position where they get plenty of fresh air and sun-shine and the air round them is not moist. Thus the tobacco plant is favoured and the fungus is discouraged.

Another example is the bud-rot of palms. As it is not practicable to spray palmyra trees with a fungicide, recourse must be had to the surgeon's knife. So familiar have the Tahsildars, Revenue Inspectors and Village Officers, who carry out in the field the operations against this disease, become with the symptoms that, in the majority of cases, they can detect a diseased tree before the central bud is killed. If they cut off every leaf base that shows the diseased spots, the fungus is completely removed and the tree grows a new set of leaves that are quite healthy. It is not possible to save every infected tree because the first outward sign of disease in some cases appears only after the growing point is dead and the tree is beyond recovery. When the central expanding leaf becomes yellow it is possible to save the tree by promptly cutting off all the diseased leaf-bases but unless this is done within the first 3 or 4 days it is useless as the bud is killed by the fungus meantime. In other cases rows of spots appear on the leaves and such a tree can be saved by prompt surgical treatment in every case.

In 1910 when we were not so familiar with the disease the number of trees that died was 74,000 and there were very few recoveries. In 1914, 33,000 untreated trees died and 41,000 recovered after treatment, while in 1915, 20,000 untreated trees died and 32,000 treated ones recovered. Thus in the last two years 73,000 palmyra trees have been saved from death and this means a considerable gain to the cultivators, besides which the disease is now more in hand than it has ever been.

Manuring of Sugar Cane in Godavari and Vizagapatam Districts.

In the deltaic tracts of the Godavari district cane fields are usually crowbarred in January after paddy harvest when the land cracks fairly deep. The work is generally done on contract at Rs. 10/- to 12/- per acre. When the clods dry fairly well the

fields are flooded towards the middle of February, cane sets broadcast the next day and pressed down in the mire. No initial manuring is generally done. The fields are usually trenched towards the end of April and before the closure of the canals when one good flooding is given. No irrigations are given in the hottest part of the year for nearly 40 to 45 days when the canals are closed. The deep tillage by crowbarring and the retentive nature of the soil (heavy black clay) maintain the crop during this period of drought. This may probably be the reason for not applying any manure when the crop is planted as manured fields suffer most in the hot weather and they must consequently be irrigated.

When the canes are about three months old, castor cake at 10 bags (1660 lbs.) per acre is universally applied early in June after the opening of the canals or after the out-break of the South-West monsoon. This forcing manure accelerates the growth of the canes and usually very heavy crops are harvested.

The paddy crop immediately following canes is invariably poor and experience has taught the delta ryot that this is actually the case. Therefore every landlord insists in the following condition inserted in the lease. "No cane crop shall ever be cultivated on the land in the last year of the lease," so that the after effects of the cane crop are borne by the tenant as both are aware that the paddy crop after canes must necessarily be poor.

But in the Vizagapatam District the treatment is entirely different. Fields intended for cane planting are always ploughed, at least 20 times, either sheep-folded heavily at 6,000 to 8,000 sheep per acre per night or 40 cart loads of penta (a mixture of cattle manure and house hold ashes) are applied per acre. The fields are then laid into beds of convenient size for irrigation from wells and sets planted fairly in regular lines along with irrigation from March onwards. When the canes are about 2½ to 3 months

old about Rs. 20/- worth of green wild indigo plants are spread over the field, trenched and the leaf covered with the earth from trenches. Canes are regularly irrigated throughout the hot weather once a week. The nature of the soils (loams or sandy loams) and the liberal initial manuring demand copious irrigations in the hot weather. The mixed cropping of various sorts of vegetables when the canes are young is another source of drain on the soil moisture. The bulky and slow acting cattle manure applied before planting canes supplemented by the green manuring of wild indigo plant when the canes are growing is not completely utilised by the cane crop, and so the crop is never so heavy as in Godavari. As a necessary consequence the succeeding crop of ragi after canes is always very heavy and so Anakapalli ryots always insist to cultivate the lands at least for a year more after every cane crop; whereas in the Godavari delta the tenants are compelled to crop the land for a year after canes to share the poor paddy crop immediately after the canes.

D. BALAKRISHNA MURTI.

Notes.

The Board of Agriculture:—The ninth meeting of the Board of Agriculture was held on 7th February in the Phipps Laboratory at Pusa. Mr. Coventry, Agricultural Adviser to the Government of India presided. The Madras delegates, were the Director, Mr. Wood, Mr. Hilson, and Mr. Anstead, while Dr. Coleman attended to represent Mysore. A perusal of the subjects for discussion does not disclose anything of wide importance, except the question dealing with Cattle Breeding and it is to be hoped that this very important subject received the fullest consideration.

The report of the Board is not yet published, but will no doubt form the subject of further remarks in these columns. To the

general regret of all who knew him, Mr. Coventry took his leave of the Board, as he is due to retire shortly. He is not leaving India, but will assume control of the Agricultural Department in the Central States of India. Mr. Chadwick moved the vote of thanks to the Pusa staff for the general efficiency of the arrangements and the hospitable arrangements made for the comfort of the visitors. The next meeting will probably be held at Poona, as a result of an invitation tendered by Mr. Keatinge, the Director of Agriculture, in Bombay.

Controlling sex in calves:—There seems to be a theory current that the period of heat is a determining factor as to the sex of animals and it is asserted that the proportion of sexes changes with the time of service. Of numerous tests of distinct breeding operations made in New England Homestead in 1913, it was observed that when the cows were served when the period of heat was early, the proportion of male to female was 134 to 178, when in middle of heat the proportion was 67 to 58 and late in heat 77 to 44. These figures evidently show that there is a real and definite law of sex determination and that the sex ratio in cattle can be to some extent modified by controlling the time of service. It would be very useful if such tests are conducted in India to see if the theory could be corroborated. D. A. R.

That the quantity and quality of milk are influenced by causing cows to drink water in excess is a common fallacy. In a paper read by two Edinburgh college lecturers some years ago before the British Association, Dundee, the lecturers showed that a large quantity of water in a ration did not increase the percentage of water in the milk or reduce the percentage of fat. In the experiment conducted over a period of three years it was observed that the greater yield was obtained from cows on the concentrated ration. On the other hand, the cows which were fed on succulent

fodder (Turnips) gave milk which was richer in fat. It is generally viewed from the results of the experiments that the excess of drinking water does not appear to have any effect on either the quality or quantity of milk, and yet those of us engaged in dairying in India, when supplied with poor milk by a customer are often confronted with the bewildering reply that the cause of the poverty of milk is due to the large quantity of water consumed before milking! The experiments show that it is one or more of the other ingredients of the food rather than the water content, which are responsible for the variation in the output and fat content of the milk. D. A. R.

The School of Tropical Agriculture was opened at Peradeniya on the 15th of January, with the Hon'ble Sir Auton Bertram, Attorney General of Ceylon as President. It was attended by a large number of people from all parts of Ceylon.

In a lecture delivered recently at the Calcutta Senate House, Dr. Bentley traced the relation between Malaria and Agriculture. He is of opinion that where agriculture prospered, malaria was little in evidence and vice versa. He substantiated this statement from Government and other reports in Bengal which showed that agricultural deterioration took place where malaria prevailed. Large quantities of water are necessary for crops like paddy and in such places there was very little of malaria, whereas insufficiency of water brought in, deterioration in agriculture and along with it malaria. It would be very interesting if corroborative evidence is forthcoming in other Provinces, specially in this Presidency, and although we are aware that in dry districts like Bellary, malaria is more prevalent than in the deltaic districts of Godavari or Kistna, we are not prepared to say that such districts in consequence deteriorated agriculturally.

Speaking about malaria, we are informed that sunflowers are reputed to be antimalarial in action. Experiments have been conducted in swampy districts of the river Potamic and in the neighbourhood of the Scheldt in Holland, where sunflowers are largely cultivated with the result that malaria has ceased to be endemic. On this subject *the Statesman* says "the observer attributed the antimalarial action of the sunflowers, not only to their properties of absorbing and destroying malarial miasm and of emitting an abundance of pure oxygen, as recorded by other observers, but also to their great capacity owing to their rapid and vigorous vegetation of absorbing and utilising the moisture of the soil in districts which are unfit for human habitation. The aromatic odour of the flowers may also be possessed of aromatic virtues"

The oil content of a seed is influenced more by the climatic conditions than by the soil. Within ordinary limits the relative fertility of the soil remains a minor factor in influencing the size of the seed and its oil content. In fertiliser tests with cotton the addition of a complete fertiliser to an unproductive soil gave larger seed and considerably a higher percentage of oil. Application of increased quantities of nitrogen did not affect the size of the seed but lowered the percentage of oil. Increasing application of phosphorus or potassium did not affect their character. In pot culture tests with soy beans, the addition of phosphorus did not change the size of the seed but increased the oil content. (Extract from *the Agricultural News*). K. U. K. M.

An old Cocoa planter of Jamaica has found out a means of smothering the rat out of his estate. What he did was that he built one or more wood fires ready for lighting on the windward side. At dusk with a steady breeze blowing he lighted the fires and threw on them a number of smoke forming substances such as

sulphur, incense &c. together with a quart of bird's eye pepper. In his own experience he says that it is 7 years since he tried this remedy and the rats have not returned. Human beings are advised to keep out of the track of this smoke. [The Journal of Jamaica Agl. Society extracted in Tropical Agriculturist].
K. U. K. M.

Rainmaking. The Government of New South Wales intends to finance Mr. J. G. Balsillie in his experiments at the artificial production of rain.

A captive balloon coated with metallic paint and at a height of about 6000 feet is to be made to discharge electricity into the atmosphere. This, it is believed, will cause the adjoining clouds to give up their moisture in the form of rain. He found that if a room be filled with steam, the discharge of high tension direct current electricity with a simultaneous discharge from a Rontgen ray tube caused the whole of the air to be cleared of steam in $1\frac{1}{2}$ seconds the floor of the room being covered with large drops.
T. S. V.

We are sorry to record the death of (Professor) Dr. E. W. Hilgard at California at the age of eighty-three—a name which should be familiar to students of Agriculture. He was a native of Rhenish Bavaria but was taken to America in early childhood. His scientific studies were pursued at Heidelberg, Zurich, and Freiburg. He became State Geologist of Mississippi, and Professor of Chemistry at the University of Michigan. His chief work was done as professor of Agriculture at the University of California from 1874 to 1904 and as Director of California Experiment Station. He established the first experiment station in the United States. He also inaugurated the system of 'Farmers' institutes.' He received the Liebig Medal from Munich Academy of Sciences, and a gold medal at the Paris exhibition of 1900. Dr. Hilgard was the author

of numerous books and monographs dealing especially with the investigation of soils. (Extract from nature). K. U. K. M.

Banana flour. The manufacture of banana meal or flour as a regular industry promises to be an effect of the war realised in Jamaica. The diminished sales of bananas, says Popular Science Siftings, have led to careful experiments, and a consular report states that in one of these 537 pounds of fruit yielded 138 pounds of flour, the cost being low enough to make selling at 2 pence a pound very profitable. Mixed with wheat flour, the banana meal makes satisfactory and nutritious bread and cakes that housewives are urged to try. For bread, the material may be equal to or some what less than the wheat flour and for plain cake or ginger bread the banana meal may be substituted entirely for other flour, the other ingredients usually being added. (From the Indian Review). W. R.

Blood bread. Prof. Kober, of Munich, has just published a little treatise on the utilisation of blood as food. For centuries blood bread has been the staff of life of the Esthonians of the Baltic Provinces and their colonies in all parts of Russia. It is made of rye flour, with an admixture of at least 10 per cent of whipped hogs' blood. In the vicinity of Petrograd ox-blood is also used. Blood bread is very nutritious and is highly praised by Esthonian physicians because of its richness in organic compounds of phosphorus and nerve-restoring salts. Bread made with ox blood dries very quickly, but this defect can be remedied by the addition of potato flour, which is now a common practice in Germany. Blood bread is the most natural substitute for meat and says the Professor, with Government control of the slaughter houses, it need cost little or no more than ordinary bread. According to the "Frankfurter Zeitung" rye bread containing hog's

blood has long been used in Oldenburg. (Popular Science Siftings). W. R.

Estate Notes.

The College dairy has been recently strengthened by the purchase of a herd of cattle belonging to Major Loch of Remount Depot, Hosur. The herd consists of four cows of which one is a Jersey, two imported Jersey-Australians, an Australian-Angole cross, a Jersey bull and four heifers of varying ages. The Jersey bull is said to be a good stock getter.

The plague scare regarding which a reference was made in our last issue has completely disappeared. The College reopened on the 1st March and is working at full strength. Since the estate has been declared free, all officers who were in health camps and in the Forest College have returned to their quarters.

Departmental Notes.

Mr. Rudolf D. Anstead who has long been near us but not of us, has now been formally made a member of the Department with the title "Deputy Director of Agriculture, Planting Districts." We congratulate Mr. Anstead, and at the same time congratulate ourselves, that this will give us an additional claim on him for matter for this Journal. There are rumours of expansion in other directions, and the Department seems to be rapidly making a name for itself.

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OF

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N. B.-Contributors are requested to send in their contributions written legibly in ink on one side of the paper only.—Editor.

Editorial Notes.

The College was very fortunate in having in its midst a distinguished visitor in the person of Prof. J. A. Todd of the chair of Economics in the University College, Nottingham, who had specially come to India for the purpose of delivering a series of lectures in economics in the University of Punjab. We learn that his hobby has all along been to visit different parts of the world where cotton is grown and India has naturally come under his purview. He spent five years in Egypt studying cotton, especially the manufacturing side of it and has travelled extensively in America winning for himself the reputation of being one of the experts on cotton in the world. His book on "The world's cotton" is well known. Prof. Todd gave two public lectures in a fascinating and lucid style, and we hope to publish abstracts of them in our next issue.

The selection of students for the college during the first week in June at Coimbatore has become quite a *mamool*. We find there is going to be a departure in the right direction this year in holding a special selection examination at Anakapalli with the object of making it more accessible to candidates resident in the Northern districts, who, owing to distance, have not been able to come in such numbers as one would wish. The selection will be on the 22nd of May and the following days and we hope the privilege will be fully taken advantage of by all prospective students. We believe that no other college in the Presidency extends this concession.

The interest that the Legislative Council members are taking of late in the Agricultural Department is more than of passing interest. In almost every agenda of the meeting, some reference is made to the departmental work. This is as it should be. Every representative of a district is fighting to have a separate Experimental Farm for his district. As men become available, we have no doubt that the Govt. will institute more farms to meet the wishes and needs of the people.

We are in receipt of the College Calendar for 1915-16, which we regret to note is very much belated. In normal years the College would have been closed by now and to be of any real use it ought to be out before the end of the first term. The frontispiece of the College is excellent although we miss the College group photo. This omission we hope will be remedied in future volumes. We also note that owing to the change in the courses of instruction the Robertson and Clogstoun medals will in future be awarded to the best man of the year in the diploma and certificate courses respectively.

In running our eyes through the rules of the students club we come across the following as one of the duties of the Secretary.

“He shall arrange for at least three meetings of the club, in a term at one of which a paper shall be read in another a debate and the third to be a social gathering.” We have not often heard of papers read and debates held, but we are quite sure the Secretary has always exerted himself in getting up the Social gatherings. The literary side of the Club, we regret to note has never been very active and this year it has nearly become moribund. We, however, notice that of late it has been unusually active in holding weekly debates, instead of the usual reading of papers by one of the staff which neither gave the students occasion to think nor encouraged their debating power. We publish elsewhere a notice of the debates held, and in our opinion the second one “It is better to be lucky than rich” was by far the best.

With great satisfaction have we noticed the appointment of Mr. M. R. Ramaswami Sivan as the Senior Assistant in Chemistry to the Govt. Agricultural Chemist. Possessed as he is of zeal and earnestness of purpose, Mr. Sivan has earned a name as a good teacher. We congratulate him on his promotion and wish that he will soon climb up the ladder of gazetted appointments one of which he now holds.

Madras Agriculture: its Progress and its future.*

I wish to attempt to note in a very brief manner some of the outstanding features of the progress and development of Madras Agriculture, and to try, however imperfectly, to forecast its general trend as a guide to the direction in which future efforts for further advance

*A paper read by D. T. Chadwick Esq., M. A., I. C. S., at the Madras Exhibition in January 1916.

should take. Other lecturers will deal with particular problems of agricultural interest and I will confine myself to the consideration of the general trend of events. I have no wish to weary you with figures. But a few are necessary in order to illustrate the chief points. In the first place, the area within our Presidency which is annually cultivated is now 39 million acres, an extent equal to more than three times that of the arable area of Japan and almost three times the arable extent of the whole of the United Kingdom; and practically the whole of this large area is cultivated by an immense number of small farmers, whose holdings are frequently very scattered. Only in the planting districts do we find large compact areas under one management, such as form a great feature in the newly-opened countries of West America, Argentine and Australia. I am speaking here not in the interests of any particular trade or industry, but from the point of view of the farmer, the producer, the ryot, who wishes to maintain the fertility of the soil and at the same time is anxious to get the best price for his produce.

The last fifty to one hundred years has witnessed in nearly every country of the world a great change or the beginning of great changes in the general agricultural economy thereof. The great modifying cause of this change has been the enormous alteration in the general trade of the world due to a great improvement in the methods of transport. The result has been to bring all countries which could in any way pretend to possess stability and order into ever closer and closer commercial communion. One great result has been wider markets with steadier prices for agricultural produce of all such countries, and as far as pure agricultural practice is concerned the chief result of these improved methods of transit has been, in Europe, the great improvement in livestock of all kinds from cattle to poultry, in other temperate zones of the world a vast expansion of the area under wheat, and as far as tropical countries are concerned a most exceptional demand for their produce and especially for their industrial crops such as cotton, oil and rubber. These are crops which cannot as a rule be grown commercially outside tropical and sub-tropical areas, consequently in these products the countries so situated have a monopoly.

It is thus worth while to examine the prospective demand for our industrial produce and look to our present and future competitors in the world's market. Leaving out of consideration for the moment the planters' products, a little more than three quarters of our large cultivated area is under food grains, practically the whole of which are consumed within the country. For the support of our own local industries and for trade with other countries our three chief crops from the low lands are cotton, groundnut and coconut, which together represent less than one-seventh of our total cultivated area. A sure and steady market is almost more necessary for agricultural development than for any other trade, as the general agricultural economy of a large tract cannot be altered in the space of a few years. Therefore in the long run those countries are likely to be in a favourable position which supply fundamental world needs, and in this we are fortunate, for our main industrial crops, cotton and oil, certainly meet such needs. The first signs of any progressive civilization anywhere is that the people use more clothes. I do not only mean that they possibly wear more clothes at one and the same time, but they require greater supply, possibly owing to entrusting them more frequently to the destructive hands of the washerman. In either case it means a greater annual consumption, and for making most of the fabrics in general, personal or domestic use, cotton is essential. It is not easy to visualise what this demand for cotton means. But the following may serve as an illustration. Within the last twenty years the consumption of cotton clothes in India alone has increased by more than 50 per cent; and suppose that everybody in India was to use one more yard of cotton cloth per year than he does at present, whether in the form of clothes or as dusters in their houses, it would require a bulk of cotton equal to half the total annual outturn of our Presidency to satisfy that increased demand. The world will have cotton, and even the great upset of the present war has not caused anything like the fall in the demand therefor which was predicted. We therefore in Madras are in a favourable position in having cotton as one of our chief industrial crops. The one result of a worldwide market for any product is a general level or uniformity in price, and in cases of a world necessity

the price which that commodity will command is roughly regulated by the cost of production at the place where it is most expensive to produce. Thus the United States of America which for many years has been the biggest producer of cotton, and the world prices have depended very largely on the cost of cotton in America. It is said that twenty years ago the American farmer could afford to sell his cotton at 3 annas a pound and still get a profit, but with the present demand for cotton which with the increased cost of labour and the greater use of fertilizers cannot be cultivated at a profit unless 6 annas a pound is obtained for the produce. Our Madras cotton is certainly of shorter staple than American and so generally commands a lower price, but even so, the actual cost of production is as a rule less than 2 annas a pound, so that allowing for ginning percentage, brokerage, etc., a market quotation of 4 annas a pound leaves the crop a profitable one to the vast majority of our blacksoil ryots. During the last year, which has been a most difficult one for many a cotton-grower, the average price for Madras cotton has been about $4\frac{1}{2}$ annas a pound. Therefore, it not only appears that the total world demand for cotton will not decrease but in the long run will steadily tend to expand, but also with the cost of production in the United States as it is at present, it seems sure that the price will be one which will be steadily remunerative to the Madras ryots. This of course leaves out of consideration possible future competitors in the form of countries as yet undeveloped. We must be prepared in the far future for competition in cotton from large tracts in Africa, and during the last ten years much money has been spent by European countries in endeavouring to foster cotton cultivation in that continent. But so far all their outlay in all those countries has only resulted in a total crop equal to the present annual yield of our Presidency alone and over all such countries we possess an enormous initial advantage in that our Presidency is already fairly well developed. Order has been established for many years and trade connections have been formed. Our other great industrial crop is oil seeds—notably groundnut and coconut. I will not deal with this in such detail because in the main its features are very similar. One of the great results of the application of scientific knowledge to industrial

arts has been a vast increase in the uses to which vegetable oils can be put, and although we are likely to meet competition in the oil market from Africa more quickly than cotton, yet in regard to that also we are at present in a favourable position.

The Madras ryot has already responded very largely to this steady increasing world demand for cotton and oil. In the last forty five years the area under groundnut alone in this Presidency has increased by $1\frac{1}{2}$ million acres. It is only for ryotwari villages that we have anything like complete statistics for long series of years. These represent roughly three-quarters of our total cultivated area. In the last twenty years in these ryotwari villages the area under cotton and groundnut alone has increased by about a million acres, or 24 per cent. This expansion has not been entirely at the expense of our food-grains, for the area under cereals and pulses has also increased by half a million acres, certainly very much slower rate of increase but yet one which is probably sufficient for the increased local demand, because there has been a large rise in the imports of foodstuffs. Thus the Madras ryot has undoubtedly responded to the increased demand for his industrial produce and the prospect for the future in regard to these crops is also promising.

But the prospect is not sufficient. It is essential for the general welfare of the country that the Agricultural section thereof derive as full benefit as possible from this world demand for its products. We can look to no wide extension of cultivation such as is possible in large undeveloped countries of Africa. An increase in the total out-put of the country must mainly result from steady improvements in the methods of farming. But even that is not sufficient to ensure that the Madras ryot shall realise to the full the advantages which the demand would appear to hold to him. World-wide markets bring with them great benefits but at the same time possess grave responsibilities and dangers. With improvements in communications and organisations it always follows that a would-be purchaser who is dissatisfied with the quality of the article is often able to get what he wants elsewhere. Thus with crops which are widely grown for industrial purposes the result is that certain standards in markets

become set; and those who do not maintain those standards, sooner or later, but nevertheless surely, find that lower and lower prices can only be obtained for their produce. The last stage is of course the total practical loss to the trade. This has already practically happened once in our Presidency in regard to Tinnevely senna. Constant adulteration directly tends to damage our trade in favour of our competitors. So it is of importance to the cultivator to maintain the general quality of any produce which he puts on the world's market and probably the greatest economical improvement in our rural population will appear when any ryots who grow produce of a superior quality and handle it properly are sure of obtaining a better price for it commensurate with its quality. Very small lots of better produce are of little use to large traders, but if we can steadily improve the methods by which our better products are placed in larger quantities directly on the market, we need not, I think, fear any competition which will develop in time from other tropical countries. This point can be illustrated very clearly at present from both of our main crops. In cotton the spinner requires a fibre as uniform in staple and colour as he can obtain. If he has to mix cotton from different localities for certain purposes he obviously wants to be able to know what he is mixing. But at the same time he needs it in bulk and small isolated lots of better quality are of little or no use to him.

In regard therefore to industrial products efforts have to be directed not only towards increasing the yield by better farming and also to ensure that a better price be obtained by the ryot for the better article by better marketing. In this latter work all who will can help. It demands study, patience and commonsense and not agricultural skill. Thus on our district farms various strains of indigenous types of cotton have been grown and tested against each other several years and also different farming practices all within the resources of the ryots are tried. By this means it has been possible both in Tinnevely, Bellary and Nandyal to separate out plants which breed true and yet at the same time give not only a higher percentage of lint to seed but lint very uniform both in staple and colour. These can be seen in the

Exhibition. These strains are then grown for us under contract by ryots on a large scale. The whole of the crops so grown are purchased by the Department, carefully ginned and thus a large quantity of pure seed is obtained. This is then sold to ryots in the villages for their ordinary cultivation. The exhibits in the Agricultural section are arranged to show what a pure strain means both in the uniformity of the staple that results and also in the matter of increased yield. They are briefly abstracted in the diagram now shown. In the first place this strain gives 4 per cent more lint over the ordinary type of Tinnevellies. As it is the lint which brings in the money, there is straight away an increase of 4 per cent to the ryot, and at first this is all that he obtained by growing this good seed. He sold the lint to the local middleman who mixed it with produce from other villages and when it reached the larger dealer the latter only gave for it the ruling market price. In fact the ryot had realised nothing for growing a cotton of better quality. Two years ago arrangements were made by which the ryots in two villages which had grown this cotton on a large scale took in their produce at one and the same time direct to the big dealer. By this means there was a fair bulk of it brought at one time, and as a result it was possible for the villagers to obtain about 5 per cent increase in price over the ordinary market rate for ordinary cotton. Thus they not only obtained the increase due to 4 per cent increase in quantity which they had obtained in the previous years, but they also got 5 per cent increase in price on their whole consignment on account of the better quality and also got back all their seed pure and unmixed for next year's sowings. In an ordinary normal year this means at least from Rs. 4 to Rs. 6 an acre increase in the return they get from their crop. And remember it is all profit. It means in fact an increase in profits of anything from about 18 to 25 per cent. This is very considerable. But it chiefly depends on maintaining the quality of the article and selling it in bulk direct. Two years ago two villages did this. Last year thirty villages did it; and between these and the seed which were sold direct through departmental agencies there were 34,000 acres to our own knowledge under pure types of cotton. Whilst about 10 years ago it was reported that

in Kurnool it was exceedingly difficult to find a field which did not grow cotton of two or three different varieties mixed together. I am not putting these figures before you as a record of any achievement but only as an illustration to emphasise the importance to the cultivator of growing his crops pure and marketing them direct and well. It is he whom we all want to see profited by raising crops of better quality. The other point I would like to deduce from these figures is that whilst 34,000 acres may seem a nice round figure, yet it is a very small proportion of the two million acres on which cotton is grown in our Presidency.

Cotton in this Presidency in recent years also provides a warning. In the recent review on Agriculture in India published by the Government of India the introduction of Cambodia cotton into Madras was described as the most successful effort in introducing exotic cottons into India. Six years ago this cotton commanded a premium of 12½ per cent. to 15 per cent. in price over the best strain of Madras cotton. Still later a large Lancashire spinner told the Secretary of State that the mills he was interested in were ready to buy the whole Madras crop of Cambodia cotton and more at higher rates if they could only get it pure. But yet Cambodia cotton now sells at ordinary Madras rates or mostly so; the one great reason is that it is difficult to get it pure in bulk. Only joint action in marketing can assure to small holders the profits due to them for the quality of the produce they grow.

The next illustration I would take is from groundnut. The gross annual value of this crop to our Presidency is now somewhere about seventy million rupees a year. The bulk of it is exported to France and regularly for some years on the Marseilles market Madras groundnut has uniformly got the bottom price. This means that if the production in other parts of the world were to increase rapidly, it is the Madras farmer who would first of all feel the effects of that competition. On analysis after production our groundnut is not so inferior in oil content as to warrant the difference in price which is often obtained for it in Marseilles when compared with the produce of West Africa, and the disability under which our trade in groundnut rests can largely

be removed by our own efforts. In order to prevent the breaking of the kernels when the shells are removed in the old traditional methods by beating with a stick the heap of groundnut is wetted. Unless they are most carefully dried afterwards some dampness still hangs around the kernels with the result that after they have been left in bags for some time they begin to turn rancid. There is a bag of such groundnut in the exhibition and I have brought some of them here. I ask you to look at this sample of black dirty, evil-smelling groundnuts which I now hand round. This is not specially prepared for the exhibition but a bag which was simply taken from a godown in Georgetown last week. It is obvious that any sample such as these is useless for extracting the best quality of oil, and the evil does not remain there because if some of these wetted kernels which still retain their dampness are shipped along with others which at time of shipment were perfectly dry, rancidity will spread from the damp ones to the good ones, and to a certain extent spoil their quality also. This damping could be entirely prevented by the use of machinery for shelling, of which there are several cheap types on the market. The Pondicherry Chamber of Commerce gave the difference in price between the machine shelled and hand-shelled kernels at from Rs. 5 to Rs. 6 a candy of 529 pounds, that even taking an outturn a little below normal means that if a ryot could get his nuts always shelled by machinery they would be worth from Rs. 9 to Rs. 10 an acre more to him. Of course only very large private owners can erect this machinery for their own use although it is not very expensive. But there is an opening here whereby, by combination among the ryots, they ought to be able to increase their profits. I hope soon to have regular running tests made with some of the machines on the market to find the minimum quantity which must be handled to make their use distinctly profitable. But here again we are losing through bad marketing. Time does not permit me to do more than refer very briefly to actuals of improvements in farming practices which have been adopted by the ryots. Speaking here in Madras I thought it was preferable to emphasise the facts that in cotton and oil-seeds we had the prospect of a safe steady and developing market, that our trade in these commodities has been

steadily increasing but, that in both of them we have still to make vast improvements in our methods of handling and marketing in order to ensure to our cultivators a fair share in the profits resulting from this increased demand and in order to establish our position in these markets against our competitors of the future. It is the same right through. In speaking about indigo only the other day Mr. C. B. Simpson emphasised the fact that it would be an immense advantage to Madras trade if both ryots and merchants ever came definitely to sell the products between themselves on a basis of actual analysis of the dye, instead of on a system of more or less arbitrary deductions from ruling prices. It will doubtless be a long task to establish intelligent co-operative marketing, and the path may be strewn with disappointments. But the task is not hopeless.

The ryot is by no means for ever bound by tradition. Many there are, of course, who will not deviate from the custom of their fathers. But we now know that trained men in the villages speaking from knowledge and speaking with knowledge can prevail on some of the more wisely venturesome to test new methods. But the man who ventures to argue with the ryots must be thoroughly trained and sure in his own knowledge of facts. Given these, our experience has been that slowly ryots will try new methods even to the extent of climbing areca palms and spraying the nuts with copper sulphate to forestall the possible ravages of disease. Amongst other samples of better farming practice which have been adopted may be cited very considerable sales of green manure seeds for growth of leguminous crops on paddy lands ultimately to be ploughed in. The use in Tinnevely in a 11,000 acres by the ryots themselves of the seed drill, the treating of cholam seed with copper sulphate before sowing as a preventive against smut and so forth. All these and others are now on the tens of thousands of acres. But the ryot will not derive the full benefit that he should from the adoption of improved practice and the use of purer seed unless his method of marketing is also improved and his trade be better organized. This is likely to be a much more difficult matter than the mere teaching of better methods; it is a problem with many local ramifications in every tract, and one which needs most careful

local study, but it is one which will have to be faced and which is becoming more and more insistent every year. In this the chief port and chief trading centre of our Presidency it seems appropriate to emphasise the question of marketing.

Chrysanthemum cultivation around Coimbatore.

Plants are cultivated not only for seed, bark or leaf but also for flowers. Flowers of some plants are beautiful to look at and extremely fragrant and from the petals of such flowers are extracted some of the most delicious perfumes. Beautiful bouquets and guady garlands are also made of them. The importance of flowers in worshipping gods among the Hindus and on marriage occasions is too well known to need comment here. The cultivation of such flower-yielding plants gives very high remunerative returns when carried out in places where there are facilities for marketing. In Coimbatore there is a large sale for flowers of chrysanthemums which are cultivated in the neighbouring villages of Kurichi, Kuniamuthur and Pallepalayam. The plant is a shrub of many roots and stems and is propagated by division: that is, by dividing it into as many slips as it can give. After the final picking of the flowers the plants are pruned, and irrigated which make them grow and shoot up quickly. They are lifted, divided and planted out avoiding the parent stem.

The season for its cultivation corresponds to that of hot weather cholam of Coimbatore. The planting is done in March—April and the plants begin to flush in July.

Chrysanthemums grow well on clayey soils under well irrigation. The field intended for the cultivation is well ploughed and fallowed for a period of 3 or 4 months. Sheep-folding is the common manure the crop receives; but it is not uncommon to manure the land with cattle dung. If the tilth happens to be

fresh or the initial manuring unsatisfactory a dose of municipal rubbish or horse dung will be given to individual plants and worked in with mamotti. The land is laid into square beds, irrigated and planted with slips at 2½ feet apart. The crop, on the whole, receives six irrigations regulated at intervals of seven days or more according to soil conditions and season. Copious watering is necessary when the plants begin to flower.

After the plants are established the land is kept clear of weeds and stirred now and then to provide a surface mulch.

Two varieties of chrysanthemums are found in these villages viz., the indigenous and the introduced; the latter variety according to the version of the ryots was introduced from Jalarpet. Flowers of both are yellow in colour although a few white flowered plants are seen here and there. The local variety bears small sized flowers emitting good smell. These are liked by ladies for decorating their hair. This variety flushes only once. The other variety is more popularly cultivated as it gives two flushings. The flowers are bigger and are used for garlands. There is a great demand for them in and outside Coimbatore. Flowers in large quantities are also sent to Palghat and other big towns.

The Muhammadan flower merchants of Coimbatore are the actual cultivators who take the land on lease paying Rs. 150/- to Rs. 200/- per acre. The cost of irrigation is always borne by the proprietor of the land. No definite information is available regarding the gross income from the produce which must be about Rs. 300/- per acre. The cost of production does not exceed Rs. 60/-. It is under contemplation to try this crop on the Central Farm and the result is awaited with interest.

The cultivation of a crop for flowers like chrysanthemum is a paying one and it is neither expensive nor laborious. In Mangalore, for example, the Christian women make handsome profits from the jasmine flower industry. Therefore there is scope for

agriculturists living in the neighbourhood of big towns to develop other aspects of farming besides the time honoured cultivation of field crops.

M. K. NAMBIAR.

Some aspects of Coconut cultivation in the West Coast.

An ideal coconut palm may be taken as one that bears early, produces the maximum number of well sized nuts in a year and has a long fruitful life. According to the experience of the writer about coconut palms in the West Coast of this Presidency, the following points may be of interest.

A coconut palm comes to fruit early or late due to various causes. Even in the same locality soil differences have been found to affect it very much. A palm put in a well drained land close to ponds or other cool places has been found to bear earlier. Proximity to sea or saltish back-waters is one of the most congenial conditions for planting them to get an early crop. A very thickly planted coconut garden seldom brings in early harvest. In a plantation if well manured catch crops like vegetables chillies etc., are cultivated coconut seedlings have been found to grow very vigorously so as to come into bearing early. Good seedlings when planted grow vigorously and a vigorous seedling is the result of a good seed nut. It is therefore of extreme importance to select the best seed coconuts for planting.

Much has been said about the selection of seed coconuts for planting. Doubts have been expressed in certain quarters as to the inadvisability of rejecting nuts from young plants. Instances have also been quoted of such selections having proved successful in producing palms vigorous enough to come to fruit in the 4th or 5th year. Considering all the points that contribute to the success of the plantation experience has taught the ryots of the West Coast that good sized nuts from middle aged trees should be selected for planting. Nuts formed during the hot summer months will be small and are considered

not good for seeds. Big sized nuts are obtained from the crop which flowers when rains set in and which have all through the developing period a continuous rainfall. Some palms produce nuts with small eyes, others with big ones. Those with big eyes are preferred by the planter inasmuch as the size of the eye decides whether the future plant will be thick and vigorous or thin and weak. Nuts of an oval shape when the rind is removed are considered better as they are generally found to yield a higher percentage of oil. In certain cases there is the idea of bringing seed nuts from places where the coconut palm thrives best. This idea is more due to the possibility of getting any amount of seednuts or seedlings of the desired quality or growth than to anything else. Many do condemn this idea saying that seednuts from places where the palms grow best would not prove successful in moderately suitable localities with quite different conditions. Therefore a planter away from sea-coast avoids getting them from the coast region. It cannot however mean that well developed nuts should not be selected for seed. Therefore the question must be one of acclimatised seed. There are certain varieties that grow to abnormal size. The number in a bunch of big sized nuts should naturally be fewer and therefore there is no particular object gained by choosing a variety of abnormal size for general planting. At any rate well matured nuts should be selected for seed. Seed nuts should never be dropped down from the top of the tree as a sudden fall might affect the germ. They should be slowly brought down with the help of a rope and basket. Choicest seed nuts are sometimes sold at fancy prices rising up to two annas each.

Coconut palms delight in free air and light; therefore close planting should be avoided. It is a fact that plants alongside the sea may have some access to saline matter. When it is seen that ryots actually pay for irrigating young plants with sea water although they are within a short distance from the sea, and that such irrigations do immense good to those plants, one would think that the vigorous growth of coconut palms in the coast region is more due to the breeze and the moist yet friable soil than to the saline matter present in the soil. With the required amount of water in the soil, it is a simple

matter to understand that the growth is more vigorous where the plants are exposed to breeze; the greater the breeze the larger the amount of evaporation from the leaves and therefore the greater the absorption of water and the consequent deposition of solid matter in the plant. Even in a coast lying garden instances of palms taking 8 or 10 years to come to fruit are not very rare. This is mostly due to defective treatment.

Some ryots believe that direct manuring with cattle dung or green leaves is harmful when done to young plants inasmuch as these while rotting harbour the maggots of rhinoceros beetle which they when emerge out, attack the growing points with very destructive results, especially when the plants are young. Therefore in all cases an organic manure should be well mixed up with soil and left covered in the coconut plantation. A coconut plantation when newly started may even be leased out to careful ryots to grow catch crops for any nominal rental, care being taken to see that the crops are always manured and the soil well ploughed. The writer had the occasion to advise the owner of a newly started coconut plantation as to how his coconut plants may be improved. The whole area was weedy and the plants, sickly. A few plants growing beside an implement shed, however stood out from the rest of them. And the ryot superstitiously enough attributed it to the plants being near the house forgetting the fact that the weeds at that particular place were scraped off or otherwise smothered. According to the advice given the ryot let the area to cultivate crops in the interspaces, and it had a wonderful effect on the growth of coconut palms in two years. Plants which have shown their stem high above ground have to be given direct manuring, because it may not be quite possible to grow remunerative catch crops under coconut shade. Manuring the whole area of a plantation is more desirable than applying manure to the roots of individual plants. Raising of pulse crops with any available manure is a common thing in vogue. Digging the plantation to keep down weeds and to soak in as much of the monsoon rains as possible is a regular annual treatment in all flourishing gardens. Cattle penning in the intermediate spaces between plants is often practised. If individual manuring with cattle manure,

ashes and green leaves is to be given as is done in many parts; the ryots are always careful not to make a mound of earth round the bottom of the plant or to work the soil quite close to the stem. A pit of some 15 to 18 feet in diameter is dug all round the plants sloping from the stem to the circumference where the pits are deepest. Manure is always applied at the deepest portion of the pit far away from the stem. A good deal of root pruning is also effected when the pit is dug. It may be quite possible to cultivate cover crops to be, subsequently dug in as green manure. But the idea of growing crops for the express purpose of being dug in is very strange to the local cultivator and it would take time before the method is generally adopted. Spacing the plants better is another point very much lost sight of in some parts. When a tenant is evicted improvements are paid for, calculating on the number of trees in a given area valuing each tree at a price ranging from three to five rupees. Thus if a tenant puts in the largest number of trees per acre he has been found remunerated best according to some old system. Therefore tenants who are always afraid of eviction, naturally put in more plants in a given area without considering the economic flaw if they were to enjoy the plantations. Although according to present rules the old system has given place to a new one of calculating the price of a tree from the value of the produce it can give, the tenant's method of planting is not altered. It may yet take a number of years before he realises the blunder and rectifies it. It is more surprising to see even the land owners who need not fear eviction, planting them very close copying the faulty method of the tenant. Coming to the question of spacing coconut palms, we see a thickly planted garden which enjoys the favourable condition of a sea-board bearing fruits well. In these parts over a hundred per acre is not uncommon. In the interior parts, on the other hand, hundred palms per acre would tell upon the yield very much. To plant about 60 per acre according to the soil conditions will be an average spacing for the interior. For inter-cultivation or for raising catch crops it is more convenient when plants are wider apart, provided they yield the maximum number of nuts. It is a well known saying in Malabar that coconut palms should not be planted so near as to enable the leaves of one plant to touch the leaves of the other when grown up.

An early bearing plant is often a shortlived one. So also a heavy yielder. In the interior parts away from the coast line palms come to fruit later, yield fewer nuts but live longer.

There are no methods of machine drying of kernels into Copra, so that there could be much of it for sale during the rainy season. Therefore copra manufacture is of necessity slack during that time. Shells are almost all used for fuel; the idea of manufacturing buttons out of them, carving shells into fancy cups and vases is not quite unknown. However, the industry is very limited with wide scope for expansion. The rind is sold almost exclusively for fibre making and the growth of coconut fibre trade is very encouraging with much room for further development. Perhaps the trade in fibre is the most profitable business, and it is not uncommon to see a hardy Mahomedan mortgaging his whole property to obtain the capital required to commence his little fibre business. The export trade is done by bigger wholesale dealers who get their share of the profit. Another portion of the fibre trade is in the hands of petty shopkeepers who receive fibre or yarn in barter for salt, chillies, kerosine oil, or fish etc., and sometimes even rice, sold to comparatively poorer people who take coconut fibre-making as a domestic industry on a very small scale. The quantity of fibre or yarn thus turned out is indeed large and it may be said, without fear of contradiction, that fibre or yarn-making as a domestic industry is on a firm basis as it is the means of subsistence for a large number of poor people living in coconut centres, although men engaged in yet bigger concerns or factories are very numerous. It is not claimed to deal with coconut industries exhaustively in this article. Therefore leaving aside the fibre and shell industries as subsidiary ones the copra industry has to be considered here from a ryot's point of view. Most of the ryots sell their crop as unpeeled nuts without caring for their size. Selling nuts is in many cases to meet some pressing money demand or to get rid of an old stock-

The purchaser, who is invariably cleverer than the seller, turns this to his own advantage by offering a lower price. Price is quoted for 100 or 1000 nuts with little consideration as to their size. However the purchaser picks out the smaller nuts and either rejects them or offers them a lower price. But there is no practice of grading the nuts and demanding a higher price for bigger only. If by chance the seller realises it, the cleverer purchaser has a thousand ways of avoiding him. Therefore those who sell nuts for Copra not infrequently receive a price much lower than what their produce is worth. The real value of the coconut should be calculated from the quantity of copra which it would yield; and this quantity varies with the size of the nut or kernel content. Anything that can remedy these evils and bring to the ryot his own legitimate dues must very probably be through the establishment of a co-operative copra industry for the benefit of the ryots in every coconut centre with sufficient means of paying the ryots the price of his coconuts from a calculation of the copra they yield. On the face of it this may not appear to be very serious and they may not realise that they are at such disadvantage as to urge speedy remedial measures. But it is a fact and any ryot will be able to gauge the extent of loss if he can only spend time to see carefully what enormous profit the copra maker enjoys giving him little for all the trouble he takes on his coconut plantation. When he realises this in course of time, it is quite possible for him to see that coconut plantations are worked at a greater profit than they are at present.

There are numerous varieties as shown by the colour of the rind, size and shape of nuts or thickness of kernel as indicated by some outside varietal marks of plants and nuts. Some when taken as tender coconuts are remarkably sweet while others are comparatively insipid. All these must have some bearing on the oil content, but no definite information of the sort is available.

What is urgently wanted may be to find out the most useful variety to produce an ideal plant with sufficient means to prevent its deperioration. An easy formula of a mixture of manures, and a method of treatment to improve already existing plants that are comparatively poorer although they are not far from the sea board, will be another line of improvement to be sought for. Improving the present output of coconut jaggery would certainly add to the wealth of a coconut planter. After a time when enough light has been thrown on the possibilities of coconut cultivation, both selection and manuring might merge into one producing better results which would seem fabulous to the present grower. Little work in the form of a systematic study of coconuts has as yet been done. It is hoped that the proposal already on foot to establish a coconut farm on the West Coast will soon be an accomplished fact and that the study of coconuts in all its aspects producing results which would benefit the enormous number of men engaged in coconut planting and allied industries, would be taken up.

K. UNNI KRISHNA MENON.

Hand Water Lifts in the Circars.

Ryots in the Northern Circars use a number of waterlifts. Some of them are *karem*, *yetam* (picotah) of several types, *chetiguda* and swing basket.

Near Kadiam, *karem* first attracts one's attention in addition to the universal swing basket in use every where for lifting water from very small depths. *Karem* consists of a narrow and long wooden canoe or a hollowed out trunk of a palmyra, one end of which is suspended to a long horizontal lever while the other end is resting on the ground. It is similar to, if not identical with, the ordinary "don" illustrated in Fig: 51 in Mukerji's Hand Book of Agriculture. Tin canoes, being lighter and cheaper are now re-

placing wooden or palmyra ones. Karem is chiefly used for paddy cultivation on slightly elevated fields by lifting water from very low depths. Once a field is transplanted, one is able to irrigate $1\frac{1}{2}$ or 2 acres a day provided the lift does not exceed two feet. The advantage of this over the swing basket is that *karem* can be worked by a single man while two are needed for the other.

At Samalkota we come across with picotahs of different types. The one in use in the uplands differs from the others in the methods of its working. Instead of a man walking up and down the lever, ropes are attached to the other end which the coolies pull down and fall back into a pit to add their weight also to lift the bucket. As the empty basket is again lowered down for the next charge by the man working at the bucket end, coolies at the other end get up the pit to be ready to pull the next bucket. The number of coolies for pulling varies from one to four depending on the size of the bucket used.

Another kind of picotah in use in the locality has a split palmyra, slightly curved as its lever having at one end a weight (chiefly composed of mud and stones) and it is worked by a single man. The buckets used are mostly earthen pots of different sizes.

As one reaches Anakapalli, the picotah (*yetam*) assumes huge dimensions having an entire palmyra tree hollowed out as its lever and a big palmyra stump, scooped out, to form the bucket with a stout bamboo to suspend it and the number of coolies engaged varying with the size of the bucket and the depth of the well. One will also notice that the wells are nothing but simple and irregular earthen pits with crumbling sides.

The aspect changes beyond Vizianagaram where a thin jungle wood pole forms the lever and a small earthen pot or a kerosine tin forming the bucket attached to a thin bamboo or an ordinary

gogu fibre rope. Here again, the lever is weighted at one end and worked usually by a single cooly. Here and there one may occasionally find iron buckets also just coming into use.

North of Vizianagaram the most noticeable feature is irrigation by splashing water with an irrigation spoon (*siri gooda* or *cheti guda* in Telugu and *seedo* in Uriya). This is a small bamboo basket attached to a hand stick and worked by drawing a rope for scattering water on to the fields. For growing garden crops trenches are formed 10 to 12 feet apart and water led into them from wells or tanks. A cooly, walking in the trench with a spoon in his hand splashes water over the beds to economise irrigation water. This is something like the hand watering of plants with a rose-can.

Near Chicacole a double picotah is a novelty. It has buckets at both ends of the lever. The downward pull at one end combined with the simultaneous upward push at the other by the coolies working at either end enables bigger buckets being used than otherwise. Such *yetams* are used along the margins of the Langulya.

D. BALAKRISHNA MURTHY.

Notes.

The Ongole cattle show was held this year on 16th, 17th and 18th March. The Committee are to be congratulated on the success of it. When the show is held after harvesting is finished more entries are usually obtained and this year there were about 800, which is well up to the average. In addition the quality of the exhibits was on the whole good, and better than last year. In the classes for 4 teeth, 2 teeth and milk teeth bulls, and in all the female classes there was an average of well over 50 exhibits, of a very level type. His Excellency the Governor visited the

show on the last day and presented the prizes to the winners. The crowd on the last day, in consequence, was enormous and severely taxed the small force of Police on duty. It was estimated that 10,000 people were present. The Honourable Mr. Buckley, Commissioner of Agriculture was present throughout the show, as were also several members of the Agricultural and Veterinary departments.

Three students' debates were held during March on 10, 17 and 31st respectively as follow :—

Subject :—The means at the disposal of the farmer at present for the conservation of moisture are insufficient.

Opened by K. R. Narayana Rao. x M. Balakrishna Ayyar.

Seconded by K. Achuthan Nambiar. x A. Ahamed Hussain.

Subject :—It is better to be lucky than rich.

Opener Duraiswami Ayyangar. x Araza Gopalakrishnayya.

Seconded by Anantharama Ayyar. x Arulanandam Pillai.

Subject :—That in the progress and development of education quantity is to be considered before quality.

Opened by Jeevanadas. x K. M. Jacob.

Seconded by Chakrapani Marar x Dharmalinga Mudaliar.

The motion in each case was carried by a large majority.

Peacock-Guinea Fowl Hybrids :—The cross between pea fowl and guinea fowl is a very 'wide' one that has been made a number of times. In general appearance the hybrids most closely resemble the peacock, their form being slender, particularly in the head and neck although there was a noticeable absence of all the

characteristic appendages of the head, and the great train of feathers which is the peacock's pride was very much reduced. The plumage exhibited striping, which is perhaps a primitive pattern in the peacock. It was of a dark fawn with Clock stripes in the lower part of the neck, becoming paler fawn with Clock specks in the region of the thorax, abdomen and flanks. Such hybrids are usually sterile and so it is impossible to breed them through several generations. The Journal of Heredity. K. C. J.

In the death of Sir William Turner, Vice Chancellor and Principal of the University of Edinburgh on the 5th February 1916, the University has lost a brilliant professor and the city a great man. He died at the ripe old age of 84 having served his University for well nigh fifty years. As an expositor of Anatomy as professor for 36 years he was matchless; he was known among his students to make the dry bones speak; He was created a knight in 1886, and a K. C. B., in 1901. He was the recipient of many honorary degrees from one or other of the important Universities of Great Britain. His writings in Anthropology and Cranio-logy are known all over the world and he was held as a great authority on the anatomy of the whale which was his favourite subject.

Molasses—a cattle food :—Molasses in itself is practically of no value as a cattle food, but like mustard with beef, forms an excellent condiment. So two or three pounds of molasses assist the digestion of other foods and act as a mild laxative in cattle. The Journal of the Department of Agriculture of S. Australia.

K. C. J.

Coconut Butter :—Most of the butter manufactured in Bohemia is from Indian Copra. Dried copra is sliced and fat extracted by oil presses. Powdered chalk is added to absorb the soap fats

the oil contains and is allowed to settle. The supernatant oil is pumped into a tank heated by steam pipes about 270° to 318° F. through four or five filters. The heating process is continued until the oil is clear as crystal and begins to bubble. It is then pumped into an automatic weighing apparatus and run into moulds when it is allowed to cool. The tablets or cubes are removed to the packing table. The soap fats combined with the chalk are treated with sulphuric acid which liberates the soap fats to float on the surface. These are drawn off into tubes and are sold to manufacturers of soap. The trimmings of the copra slices are made into powder for food for cattle or pigs. The coconut fat is white, but when manufactured into butter is coloured to resemble oleomargarine. Sesamum oil is added to make the product more pliant. Coconut butter keeps well either raw or refined and does not spoil for months even in warm weather. It is claimed that ordinary consumer cannot detect the difference between this butter and oleomargarine. Six or seven years ago the output of coconut butter in Austria was about 40 tons a day. It is now approximately 300 tons. The price has increased from £ 3 15 sh. to £ 5 8 sh. 6 d. for 200 lb. Queensland Agricultural Journal.

The toxic principle in cotton seed—Cotton seed meal, after expression of oil, is now used extensively as a feeding stuff for cattle in the United States. But if the animal has not been gradually accustomed to the food, poisoning and death may occur, and for this reason it is now generally avoided as a food for pigs. This toxic action has been distributed to various constituents of the seed, including the oil, the high protein content, and a salt of phosphoric acid; while decomposition products and a supposed toxic alkaloid have also been held responsible for the trouble. (Knowledge). K. U. K. M.

Departmental Notes.

1. Mr. M. B. Ramaswami Sivan, B. A., D. A. Chief assistant to be Senior assistant in Chemistry to the Government Agricultural Chemist.
2. Messrs. L. S. Natesa Iyer, D. A. and V. S. Narayanasami Iyer, D. A. Second grade Farm Managers have joined duty at the Central Farm.
3. Mr. M. K. Nambiar L. Ag. Central Farm has joined duty at the Samalkota Farm as Assistant Farm Manager in charge.
4. Mr. K. Raghavachari L. Ag. Assistant Farm Manager, Central Farm has been taken into the teaching section as an additional Assistant to the Principal.

Amendments to the rules of the M. A. S. Union received by the General Secretary.

Rule No. 2. *Insert "how attained" after "objects."

(iv) *Include "to protect the interests of the past and present students."

3. (iii) *In place of existing rule, insert "the registering of addresses of such past and present students that so desire."

(iv) *Insert "the publishing" in place of "the conducting."

(v) †Insert "by the holding of a meeting of old Students at the time of the College Day and by the submitting of memorials and deputations to the proper authorities."

4. *Insert after "membership" "eligibility" in place of "who are eligible."

6. †In place of existing rule insert "Students.....pay an advance of Rs. 2/- within 3 months of their joining the College and the balance according to the class of membership they choose to join at the end of the 2nd year or within the first three months of the third year's course."

7. Patrons.—*In place of "the Permanent Fund of the Union" insert "funds of Union."

10. †*The council.*—The following may be inserted :—

(a)ex-officio and “an Honorary President who shall be an old student.”

(b) “and five vice-presidents and fourteen members of whom “one vice-president shall be an officer member while all others shall “be old students and one vice-president and seven members shall be “resident old students.”

(c) from amongst the last; “the General Secretary, and the Editor shall be elected” in place of “General Secretary, Treasurer and joint Secretary.”

(d) The following may be omitted :—
“Two resident.....students.”

11. †*Election of council.*—All members etc.....“The resident vice-president and the 7 resident members of council including “the General Secretary and Editor” in place of “the General Secretary, Joint Secretary etc.”

12. *The working committee.*—*The resident.....Committee “with four student members instead of three.....”

13. *Journal.*—†The conduct etc.....four members including “the vice President and the Editor”. The Sub-Editor and another member of the editorial board to be elected by the working committee from their members.”

15. *All proposal.....before “the 31st May” every year for being published.....meeting.

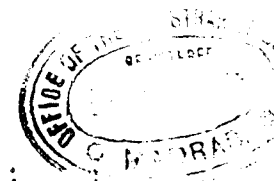
16. *In place of “the corrected list of addresses of old students.”“insert ” list of members.”

*Amendments discussed and approved by the Working Committee.

†Amendments brought forward by the members but neither discussed nor approved by the Working Committee.

A. C. & R. I., }
Coimbatore, }

K. KRISHNAMURTHI RAO,
General Secretary.



THE JOURNAL

OF

The Madras Agricultural Students' Union.

Vol. IV.

April 1916.

No. 4.

N. B.—Contributors are requested to send in their contributions written legibly in ink on one side of the paper only.—Editor.

Editorial Notes.

The long pending reorganisation of the Department being sanctioned by the Government, has been brought into force from the 1st current. We touch on a few of the special features of the scheme. The posts of the Lecturing Botanist, Veterinary and Engineering Assistants are not affected either in name or salary by the reorganisation. The nomenclature attached to the various posts will in future be as follows :—

Scientific Sections.

Agricultural Sections.

- | | | |
|------------------------|----------------------|--|
| (a) Gazetted officers. | Senior Assistant in. | Assistant Director. |
| (b) Upper Division. | Assistant in. | (i) Managers of Agricultural stations. |
| | | (ii) Agricultural demonstrators. |

- (c) Lower Division. Sub-Assistant in.
- (i) Assistant Managers of Agricultural stations.
 - (ii) Assistant Agricultural demonstrators.

The list of officers in the sub-divisions *b* and *c* as at present, will be seen under 'departmental notes' in this number.

2. Hitherto the notification of appointments, transfers and leave of officers in the Fort St. George Gazette had been the privilege of the Provincial and Imperial officers alone of the Dept., but we are extremely glad to observe that, thanks to the efforts of the M. A. S. Union, this privilege is now extended to officers of the 'upper division' also.

3. Personal scale is allowed to such officers as were likely to be affected by the introduction of the new grades. The thanks of such officers are due to the graceful act of the Director. The scheme is said to afford scope to really good men who, by showing merit in future (apart from what they have gained at present upon which coupled with seniority the lists are arranged) may aspire to reach to a maximum of 700 Rs. instead of to 400 Rs. as at present.

We may, however, point out that the maximum, where the grades are progressive, might have been reachable in 10 years as in the Educational Department. When a reorganisation is introduced it is not likely that it will be to the benefit and satisfaction of every one concerned nor can it be as lucrative as it was when the subordinates

were a few in number and the department was yet to expand. We hope that the spirit with which the reorganisation has been introduced will be appreciated. The effect of the scheme would be far reaching if there be scope for acting vacancies being filled up by men next in rank in the Department.

This year, certificates of Proficiency and Diplomas in Agriculture were awarded on Sunday the 30th to the successful students of Classes II and III respectively, by D. T. Chadwick Esq. Director of Agriculture, at the College. The addresses of the Principal and the Director are published elsewhere. Might we not suggest the publication of the results in the Fort St. George Gazette after the students have left and the awarding of the Diplomas and the certificates on the occasion of the College Day? This procedure will naturally lessen the strain on the examiners, ward off the gloomy tinge of the Diploma Day and make the College Day more attractive, better attended and more enjoyable in the salubrious portion of the year.

The Deputy Director of Agriculture, Northern Division, the Superintendent Civil Veterinary Department, the Director of Technical Education and Industries and the Deputy Director of Agriculture; Dharwar, were on the Estate towards the end of the month in connection with the examination of students of the Diploma and certificate courses. The Director of Agriculture with Mr. Allen Carruth the newly appointed

Deputy Director of Stock and Mr. Steele (of Messrs. Harvey & Co., Virudupatti) Honorary Visitor arrived on the 30th.

We beg to offer a very hearty welcome to Mr. Allen Carruth, who has recently joined the Department as Deputy Director of Agriculture for stock.

Mr. Allen
Carruth.

Personally, we shall probably feel Mr. Carruth's influence most from the improvement which may be expected to result in the Dairy, since he is an expert Dairyman besides being a judge of live stock. That he is keen may be judged from the fact that he was at the Dairy with the Principal at 5 o'clock on the morning of his first day at Coimbatore! Mr. Carruth has, we believe, had considerable experience in propagandist work, as he had been employed seven years or so in Ireland, by the Irish Agricultural Society, and what this means may be gathered from the reports of the Society which are received in the College Library and which show the Society to be one of the foremost in the world. We hope at no distant date to get Mr. Carruth to give us the benefit of his experience on the platform.

Madras thus leads the way again, as the first Provincial Department to have its own Stock officer, before even the Imperial Department has got beyond considering one. We wish Mr. Carruth every success in his efforts to improve, or more strictly perhaps, to save from deterioration, our fine South Indian Cattle, notably the Ongole and the Kangayam, with which no doubt he will soon make a start.

Rumour has it that a few more quarters for the subordinate staff and one for the Government Lecturing Botanist and one for the Assistant Principal have been sanctioned. The fast pouring in of the materials on the spot will, we hope, make the quarters of the Lecturing Botanist rise above the ground very soon.

Provincial
quarters.

A decent and well looking row of houses intended for the thotties of the estate has reached completion at the south-west corner of the Farm. This must be a boon to the thotties who suffer the inclemency of the weather in all seasons, in their present huts which by vanishing, will soon cease to be an eye sore to the College. The thotties will, we hope, on the occasion of their occupying the houses, have a sermon from the Principal, on temperance.

Thotties
quarters.

We are much obliged to Mr. M. E. Couchman, I. C. S. our first Director for the interest which he still takes in the Department and do not forget that it was his liberality which first stimulated gardening around the quarters and caused the desert if not "to blossom like the rose" at least to look rather better than when handed over by the D. P. W. Arrangements will be made to sow the beans, and we hope that Mr. Couchman, when he visits us in his new capacity, as Director of Industries, will be able to see the result. Seeds may be obtained on application to the President. (The note on the subject from Mr. Couchman we publish elsewhere).

Mr. M. E.
Couchman,
I. C. S.

The Dairy.*

It is impossible to exaggerate the importance of pure milk supply in any country: it is especially so in a country like India. Like all industries, the industry of dairying is still in its infancy in India. A tropical country, such as ours, suffers from many maladies: cholera, typhus claim many victims annually: infant mortality is still very high in spite of the advance of medical science. People little realise what a terrible source of infection milk is unless properly cared for. Milk, as you know, is a complete food. It is the entire food of the young; it sustains the weak and the old and is within the reach of the rich and poor and it behoves every man in the country to take the utmost care in giving the purest milk possible for his children.

In spite of this extreme importance, let us see how things stand at the present day. Let us take the Presidency town of Madras: you are all familiar with the degrees of dilutions your milk undergoes as it passes into the hands of the consumer. It is only the favoured few who possess their own cows that escape the villany of the Madras milkman. It is well known that prices for milk are fixed according to the proportion of water added and the public are prepared to purchase whichever quality they can afford. There is at the present day no legal measure to prosecute a man who dilutes the milk unless it can be proved that the milk had been poisoned. In England on the other hand, the percentage of fat required to be found in a sample of milk is fixed so that a dishonest dairyman may be brought to book any day.

In an Indian home milk is still the chief dietary article. It is utilised for the following purposes: (1) milk to be taken as such (2) milk for curds or butter milk and (3) milk for ghee. Whether it is intended for milk, curds or ghee, all milk is subjected to boiling. This is very necessary specially when we realise the sources of infection. If it is intended for curds or butter milk, when lukewarm a small

*Lecture delivered by Mr. D. Ananda Rao, B. Sc., at the Madras Exhibition on 5th January 1916.

quantity of old butter-milk is added which curdles the milk; this then is churned by means of a hand churner. Imagine the cleanliness of the operation! Water, neither boiled nor filtered is added up to any quantity desired and fingers and hands are freely utilised in the removal of butter from the butter-milk. In a hot country like India, people pay the utmost importance to butter milk which is pleasantly acid in taste and cooling to the system. It is considered as food and the housewife is not anxious to remove all the fat from it. The richer it is the better the taste and the better it is patronised. Butter is then removed and hardly washed. It is then clarified to be made into ghee. I shall later on endeavour to show you the defects of the various processes, but at the present moment I shall content myself only with the description of them.

The various dairy products of the country undergo free adulteration at the hands of the trader. I have already referred to the adulteration of milk with water. It sometimes happens that where there is a demand for pure cows' milk, milkmen are tempted to dilute buffaloes' milk and pass it for cows' as the former is nearly twice as rich as cows'. Butter is sometimes adulterated with flour to increase the weight. In ghee many vegetable oils are mixed e.g., gingelly, safflower, groundnut etc. In extreme cases animal fat is also mixed with it. Cows' ghee is considered to possess medicinal properties and to pass off buffaloes' ghee as such, it is not uncommon to colour it with saffron. This is roughly then the state of things with regard to Dairying in this Presidency at the present day.

If we now turn our attention to the modern methods of dealing with the production and manipulation of the dairy products, we find great many differences. Firstly, take the production of milk. A fair amount of success has been attained by successful feeding of dairy animals with concentrated food in this country. There is, however, much room for improvement. Very little attention is being paid to the cow while in health or in sickness. Proper housing against cold at night and heat by day, particular attention during the calving period and immediately after, care and proper management when ill,

are matters to which very little attention is paid in this country. Even with regard to feeding, the dairyman is content with giving nutritious oil cakes. This no doubt helps in giving rich milk. This however, is not enough. The quantity ought also to be increased. The more milk a cow gives the more money it brings. This can be brought about by giving succulent fodders in the rations in addition to oil cakes. No doubt proper housing and care of cattle and proper feeding are very important, but these are by no means enough. It is the breeding of right sort of animals suited for dairy purposes that should draw the attention of the man who starts dairying. He should produce an animal which combines in itself the quantity as well as the quality in milk. Experience has shown that it costs practically the same to feed a poor milker as a heavy yielder. Here then comes the skill of a scientific farmer. There is a branch of dairying which is outside the scope of the present lecture and I shall therefore confine myself to dairying proper and leave this most fascinating branch to abler hands than mine to deal. I can only say that this is a work which requires a deal of patience, an observant eye, a love for the animal and business aptitude. The work is slow but most promising. We have been working at the College at Coimbatore for several years and although I am glad to say that we are seeing steady improvement with regard to the yield of milk by careful breeding, it has been a very slow work. We are persevering because we know we shall reap our reward in good time.

We have so far considered the production of milk and what factors influence the quality and quantity to be obtained. The question of *treatment* of milk should then be considered. It is unfortunate that it is sadly neglected in this country. We all know that milk is the most easily contaminated of all dietary articles. Dust is the surest source of infection. With it, it carries millions of pathogenic organisms invisible to the naked eye. Hence the importance of clean cows, clean udders, clean vessels and clean hands. Nor is this all. Even smell taints the milk. Feeding cattle with onions or turnips leaves the characteristic smell in the milk. Smoke does the same. Milk may be contaminated by still another means.

namely—our ever present enemy—the housefly! Straining of milk from dirt and keeping it in vessels and rooms free from flies seem to be the methods within the means of the ordinary dairyman. We are learning every day regarding the harmful bacteria. Thanks to science, we have now measures which control the evil effects and pasteurisation and refrigeration have come to our rescue. By these methods we kill organisms which cannot stand either too much heat or too much cold and when once this is done and the dairy is cleanly maintained, the sources of infection are brought to a minimum.

If milk is analysed it is found to contain fat, proteids, sugar and water. Fat is the richest of all the milk constituents and the value of milk is recognised by the amount of fat present in it. This fat is in the form of an emulsion in milk. It is, however, the lightest of all and when milk is allowed to settle, it rises. This property is taken advantage of and many methods are adopted to remove it for its better utilisation. It may be allowed to settle in shallow vessels from which it could be skimmed. By this process the separation is not thorough. Milk is therefore subjected to a centrifugal force by which milk is revolved at a very high rate (7,000 revolutions per minute) when the lighter particles are separated from the heavier and are separately collected. This is called cream. It is utilised in tea or coffee instead of milk but of course it is intensely rich.

This cream is allowed to ripen: coloured: then churned: washed: salted: dried and packed. In this country cold water is very essential. It means, ice has to be taken recourse to specially during the hot months. Cold water tends to make the butter hard and not greasy. It is important to wash the butter well to make it free of casein which otherwise interferes with its keeping qualities. Butter-milk which is drained from such a process has no value except for drenching cattle.

The separated milk has no value in England but it has been possible to create a market for it here because in large towns it is substituted for milk in tea or coffee and it should not be despised as it contains all nutritious matter excepting fat.

Talking about milk and its products, we are dealing with two different kinds of milk in India, namely the milk of cow and buffalo. The former is the ideal one for drinking: some people are particular about cows' milk probably due to a sentiment. The milk of buffalo is on the other hand nearly twice as rich as cows' and if the system of dairying is intended for butter making it is desirable to maintain a herd of buffaloes. If for both milk and butter, it goes without saying, that a mixed herd is the proper thing.

We shall now pause to consider the main difference between the indigenous and modern methods of dealing with dairy products. In the former, milk is converted into curds which contain fat, casein and albumen. The revolutions are necessarily slow. This means incomplete separation of butter. Again, a large portion of caseinous matter is removed along with butter, and this is not properly washed, which leads to the putrifaction of butter. Whereas in the modern methods, the milk before being ripened, undergoes a process of separation into cream and skimmed milk. The former contains entirely fat with a very small proportion of milk. It is then curdled, churned and washed to remove all casein. Fat globules which were in an emulsified form begin to coalesce. Water interferes also with the keeping qualities and therefore it is dried and salted.

There is still another difference: butter as butter has no value to the present day Indian. He wants it for ghee and since it is clarified, it does not pay him to wash it well or to take so much trouble.

How is the future outlook with regard to the introduction of new methods in dairying? Sanitation is making rapid strides and at no distant future, I believe dairies will be much more sanitarily managed than they are at the present day. They have besides to be run on business lines and unless this is done there is no scope of success. I shall try to indicate a few of the lines which I consider essential in making dairying pay.

First: A dairy breed has to be maintained. As a rule the Indian cow is a poor milker. Her average is about 4 lbs. a day,

whereas in England it is at least five times as much. The maximum that an Indian cow could give is about 20 lbs. whereas 45 lbs. is not infrequently obtained in England and America. This is a hereditary quality and can be increased by proper methods of breeding. Since this quality is transmitted by the male, it is incumbent that good dairy bulls should be maintained and hence the importance of *herd Registers* in which a record of the history of the bull is maintained.

Secondly: having got the right sort of breed we should attend to them carefully with regard to their housing and feeding. The cow is a milk-manufacturing machine. It utilises all the food given it. But too much of it tends it to put on fat. The cow should be in good condition but not too fat.

Thirdly: too much importance cannot be attached to the maintenance of milk records i. e., the quantity of milk given by a cow during the year. This is influenced by various causes but it is important to consider the dry period of the cow. If the dry period is unduly prolonged the quantity is lessened. The records also enable one to find which animal is paying and which is not and once this is obtained the undesirable cows should be sold off. These records have to be maintained for a number of years and should show the performance of each cow during the year under consideration and should include the date on which the cow had taken the bull, the date of calving, the number of days in milk, the dry period and so on.

Lastly paying attention to detail, cleanliness, consideration of methods which are most profitable and yet economical are other factors which would make dairying commercially successful.

There are, however, certain limitations with regard to the introduction of dairy farms throughout the country in any extensive scale.

Firstly, it means heavy initial capital for the purchase of cattle, land, buildings and dairy equipment.

Secondly, dairying requires technical skill. It is not every one that can do it. Although it is easily learnt, a certain amount of experience is needed to be a successful dairyman.

Thirdly, to be successful a man must have business aptitude.

Fourthly, milk and its products undergo decomposition quickly and as such distance to which milk is transported is limited. Milk has to be pasteurised and requires cans for transport to any distance. Butter has not caught the fancy of the Indian consumer. We have to depend upon the European for its consumption as butter. It therefore restricts the places where dairy farms could be established; they must be within reach of large towns for the disposal of butter as well as of separated milk.

But the prospects of their introduction are fair although many people are ignorant of the success of such farms. They could be run on commercial lines with great profit and dairying is one of the cleanest industries known.

An Improved Sugarcane Mill and Jaggery making Furnace.*

Some of the old students will probably remember visiting the lands of M. R. Ry. R. Sivarama Ayyar, Avergal, B. A., B. L., of Ravanasamudram, Ambasamudram Taluk, Tinnevely District. He has an oil engine (7½ B. H. P.) and pump by means of which water is pumped on to a stretch of land which had previously been often left waste. Sugarcane is cultivated by tenants on part of this land. The cane is crushed in an iron three roller mill driven by the 7½ B. H. P. engine, the juice is then pumped by means of a small centrifugal pump into the boiling pans. These have been built according to one of the earliest of Mr. Chatterton's plans. There are two sets of 3 pans, those in each set adjoining each other but each with a separate grate. Two fires in each set are maintained, and the smoke therefrom drawn under the third pan. The heat from this hardly suffices to boil down the juice in the third pan. Those who were at the exhibition will notice that this differs from Mr. Chatterton's latest furnace in the arrangement of the pans and fire grates. Mr. Sivarama Ayyar has kindly

*From the Director of Agriculture, Madras.

sent a detailed statement of his cost of working etc. which is of interest and is reproduced in full.

It will be noticed that the yield is put at 2 tons of jaggery an acre which is only average and ought, one would think, to be capable of improvement.

My thanks are due to Mr. Sivarama Ayyar for his figures.

Statement of Accounts.

I. Initial Expenses:—

	Rs.	A.	P.
1. Crushing plant	450	0	0
2. Tube well	100	0	0
3. Shafting, etc.	100	0	0
4. 7½ B. H. P. Engine without the pump ...	1500	0	0
5. Engine Shed	400	0	0
6. Boiling and store rooms	500	0	0
7. Pans (6)	90	0	0
8. Miscellaneous	30	0	0
Total ...	3,170	0	0

II. Running Expenses:—

The Engine works for 125 days in a year, 90 in pumping and 35 in crushing canes.

1. The Driver is paid Rs. 120 for a year at Rs. 10 a month. His pay for the 35 days of crushing is 28 p. c. of 120 ...	33	9	7
2. 1½ tins of yellow oil for a day Rs. 2-4-0. Castor and coconut oils for a day 0-8-0; for 35 days at Rs. 2-12-0 a day ...	96	4	0
Total ...	129	13	7

III. Repairs and Renewals:—

1. Rollers had to be renewed after 5 years' work at Rs. 50 i. e. for a year ...	10	0	0
---	----	---	---

2. Tube well may require about	...	1	0	0
3. Belts and shafting for a year	...	10	0	0
4. Pans have to be removed once in 3 years.. for a year	... ..	30	0	0
5. Miscellaneous items and repairs for the house vessels used.	... ..	10	0	0
6. Boiling and store rooms and 28% of the engine shed.	... ..	20	0	0
7. 28% of the charges for renewing parts of the engine.	... ..	3	0	0
Total	...	84	0	0

IV. Depreciation Charges and Interest:—

1. Crushing plant, tube well and shafting cost Rs. 650. Interest at 6% and depreci- ation at 5% i. e. 11%.	... ..	71	8	0
2. 28% of the engine=Rs. 420, Interest at 6% and depreciation at 7% i. e. 13%	... ..	54	9	7
3. 28% of the engine shed=112, Rooms=500. Total Rs. 612. Interest at 6% and depre- ciation at 2% i. e. 8%	... ..	48	15	4
Total	...	175	0	11

V. Crushing Charges:—

1. 6 pans require 4 men at 0-6-0 a day, for 35 days.	... ..	52	8	0
2 boys at 2 as. a day for 35 days	... ..	8	12	0
2. A Maistry at 8 as. do.	... ..	17	8	0
3. Canes are brought to the mill with some topplings and roots; for cutting them away before pressing the canes, 2 men at 0-4-0 a day for 35 days.	... ..	17	8	0

4. 2 boys at 2 as. a day (each), one for stack- ing the canes near the plant and another to hand over the canes to the person at the plant.	... ..	8	12	0
5. A grown up boy at the plant at as. 3 a day for 35 days to press the canes	... ..	6	9	0
6. 3 boys at the other side of the plant, one to remove the megass as coming out of the plant and two to take them to the drying ground at 2 as each....	... ..	13	2	0
7. A fireman at 5 as. a day.	... ..	10	15	0
8. 2 women to bring the fuel and megass to the firemen at 2 as. 6 pies each a day.	... ..	10	15	0
9. Fuel at Rs. 2-4-0 a day.	... ..	78	12	0
Total	...	225	5	0

VI. Harvesting and carrying the canes from the fields to the Mill at an average cost of 2 as. per thulam of jaggery for 2100 thulams or 1750 maunds. ...

The total cost is:

1. Running Expenses	... ..	129	13	7
2. Repairs and renewals	... ..	84	0	0
3. Depreciation and interest	... ..	175	0	0
4. Crushing charges.	... ..	225	5	0
Total	...	614	2	7

This sum or Rs. 614—2—7 is spent by the landholder. The har-
vesting charges of Rs. 262—8—0 are borne by the tenants

As the total extent cultivated is 10 acres the landlord's expense
on one acre is Rs. 61—6—8 and the tenant's expense on one acre is
Rs. 26—4—0.

In ascertaining the income per acre, it has to be borne in mind that $12\frac{1}{2}$ per cent of the standing crops are required for the seeds of the next crop. So $87\frac{1}{2}$ per cent of the canes alone are available for crushing and out of this $87\frac{1}{2}$ per cent about 210 thulams of jaggery are had. At the rate of Rs. 1—10—0 per thulam or Rs. 39 per candy they can be sold for Rs. 341—4—0. Canes growing on $12\frac{1}{2}$ cents are generally valued at Rs. 30 or Rs. 240 per acre. The total income is Rs. 371—4—0. The landlord's share is 60 per cent and the tenant's 40 per cent.

The gross income of the landlord=Rs. 222-12-0.

The tenant's income (gross) is

(1) by jaggery	Rs. 118—8—0.
(2) by canes	„ 30—0—0.
	148—8—0.

Cost of cultivation.

1. 4 ploughings at Rs. 1—4—0 each	Rs. 5 0 0
2. Work at the ridges round the field	... 0 8 0
3. Cost of manure and cartage	... 15 0 0
4. Ridging and furrowing the fields, spreading manure and planting the seeds.	... 6 4 0
5. Weeding with small spades (twice)	... 4 0 0
6. Digging and raising the furrows by throwing soil	... 4 0 0
7. Dressing manure to the crops in September-October,	... 2 8 0
8. Covering the dressed manure with soil by spading.	... 5 0 0
9. Cost of manure with cartage...	... 10 0 0
10. Fencing.	... 2 0 0
11. Watering and watching.	... 6 0 0
12. Levelling the sugarcane ground for the next paddy cultivation.	... 5 0 0
	65 4 0

Add to this :

(1) the harvesting cost.	...	...	26 4 0
(2) seeds (sets).	...	...	30 0 0
			121 8 0
The tenant's gross income was found to be	Rs. 148	8	0
His net income for an acre	...	27	0 0
The landlord's gross income was found to be	...	222	12 0
His charges	...	61	6 8
His net income per acre	...	161	5 4

R. SIVARAMA AYYAR,

Landholder.

Ravanasamudram, Tinnevely District.

Diploma Day.

Principal's Speech. The present occasion, marks a rather more definite stage than is customary on such occasions. We are closing the old course of 3 years and awarding Diplomas to the last batch of students who have been successful under that curriculum. We are simultaneously presenting the new "Certificates of Proficiency" to the first batch of students successful under the New Short Course. This is the short course of two years, from which selections will be made for the further $1\frac{1}{2}$ years necessary for the attainment of the Diploma under the new rules. The final examination for the Diploma will in future, be held in December of each year, so that this is the first, and I am glad to think, the last time when both examinations will coincide. The change has thrown a good deal of extra work on the shoulders of my section, which will be evident from the fact that in the old course, Agriculture proper was largely taught towards the end of the course, while in the new, it is largely in the beginning. The change it need hardly be said, has and will more largely yet, increase the scope of the utility of the College. The numbers at present in residence, nearly 100, are greater than they have ever been before, and have

necessitated the construction of extra quarters to meet the demand. We are also grateful to the consideration given to the proposals for a students' Pavilion and Reading Room, which has led to the sanctioning of a sum of Rs. 2000/- for its construction. This work will largely be carried by the students themselves, as part of their practical work, which will enable the building to be much larger than if it were constructed entirely by hired labour. We shall remind our many friends, when the time comes, to fill the shelves with books, and shall welcome all assistance to that end.

Turning now to the results of the present examinations, the number of failures in both is undoubtedly regrettably high. (6 in Diploma out of 18 and 10 in certificate out of 37). However much sympathy is felt for the individuals who have failed to obtain what must for them mean a very great deal, facts must be faced, and all efforts to reducing the standard, simply to increase the number of passed men must be discountenanced. To lower the standard on such personal grounds is to do a great injustice to past and present Licentiates, by cheapening the value of a prize they have gained, it is to cheapen the reputation of the College, which is based on the doings of its sons, and it is to remove the extra stimulus which is necessary if both teachers and taught are to make the very utmost of their opportunities.

You would probably like to know the criticism of the outside examiner. He was of opinion that students lacked ability to answer questions put to them, and to think out the meaning of the question and to keep the answer to that point and that alone; nextly in *viva voces* they lacked the ability to distinguish between major and minor points. I as an examiner can corroborate both points. I asked a question as to how far it will pay a man to aim at quality in his produce. Pages were written as answers to this dealing with the general improvements of crops. Again a question was asked to describe to a friend a piece of paddy land intended for sale. Many minor points with regard to nearness to road, water supply and such were mentioned without referring to the most important point, namely the yield of the land and the sale price.

There have been some changes in the rules of the College prizes to follow the change in curriculum, the most important is in the Clogstoun prize, which is no longer for the Diploma course but for the best man in the short course. This year as an exceptional case, there are two medals for the Clogstoun: one for the Diploma course and another for the certificate course.

Students in future will have to provide themselves with the uniform prescribed, a shirt for games and the College foster blaze with the pocket badges. The object of this is to foster in students a spirit of unity, so that the sight of the familiar blaze will arouse whenever seen old memories of student days. For convenience, a uniform set of field clothes of *Khaki* is also recommended for practical work.

Before closing, gentlemen, I must apologise for the heat. We usually close earlier in the year, but owing to an outbreak of plague, which has thrown everything back, we are a month later than usual.

The Director's Speech.

MR. WOOD, STAFF AND STUDENTS OF THE AGRICULTURAL COLLEGE,
COIMBATORE.

You one and all are doubtless experiencing a great sense of relief that this term has at last come to an end. It has been unduly protracted on account of plague last January which caused a serious, but I am glad to say only temporary, dislocation of work. By continuing throughout April, it has been possible to make up the course of lectures and bring the session to a satisfactory termination but any term so prolonged is a trial to all, both to staff and students and I am sure you all feel thankful that at last it is at an end. None will be feeling this sense of relief so keenly as those who have been successful in their course. Thus in the third year they completed successfully a full course of study upon which they embarked three years ago whilst others in the new 2 years' course have the satisfaction of attaining one stage at least in their progress. To all of those, we most heartily

and unreservedly give our congratulations. The Day on which a College publicly labels its students as successful is a proud day for each of those so marked and we all rejoice with you in this feeling of legitimate pride.

In one sense this Diploma Day is distinguished from all its predecessors and from all which will probably follow hereafter. It is the last time we take leave of those who have gone through the old uniform three years course. Henceforth all our students will be under the more recent regulations. You are well aware, I believe, of the reasons which led to this change. They were mainly two-fold: first, the desire to pass more students through the course in practical agriculture so that they may be better suited to manage their own lands when they return thereto; and the second reason was to ensure for the higher course a small but a picked body of students who would be able to respond more rapidly and thoroughly to the teaching in the more difficult course. Several of those who proceed to this higher course will doubtless be looking forward to gaining appointments in the Agricultural Department, and so I wish to take this opportunity to state clearly that we guarantee no appointment whatever. It is quite impossible to do so; and because students are entertained for the longer course we do not thereby make any promise to them of recruiting them ultimately into the department. Yet at the same time you know that we have vacancies and that for the present more men are needed; and that we shall look to the students who are successful in the longer course to fill several of such vacancies. To what extent men will be required to meet the growing needs of this Department depends solely on those of us who are now in the Department and on those who are now entering it and on those who shortly will join us. On previous occasions I have already said that your future in this Department is in your own hands and the fact is so true that it cannot be insisted upon too strongly. The scope of our future usefulness depends primarily

upon you and upon the traditions which we and you can build up and hand down to our successor; and I ask you as earnestly as I can to see, that the tradition which you hand down may be one of which your successor will be proud. To every body of men working as a whole on similar objects the world in course of time attaches some summary verdict. In some short and telling phrase they record their judgment. Such judgment is not infrequently unjust and incomplete. But it behoves all of us jointly and severally to do everything we can to earn a favourable verdict for our own Department. This is an obligation we owe to those who may follow after us in the dim and uncertain future. We have pleasure in welcoming today an officer who has just arrived to join us in furthering our work on cattle. We are about to take over the work connected with Pumping and Boring and Agricultural Engineering generally. Thus for the present our sphere of possible usefulness and with it, responsibility, is widening but whether this process will continue, depends solely on the tradition that you and we build up for our Department. In regard to the personal behaviour of each one of us there are, I think, at least 6 short rules which we must all endeavour to observe most strictly for the welfare and future of Agriculture. Those of you who join service are not required to administer any laws or to exercise any authority; but you go to advise, to help and to influence by your own knowledge, by skill and zeal you possess, and unless you gain the confidence of the agricultural population amongst which you have to work, your advice will not be heeded. In fact the degree of confidence that each one of you can inspire among the ryots is the exact measure of your influence and therefore of your usefulness to the Department. So in all your dealings with them, I would ask, in the first place to be courteous. Objections to new methods are often founded on ignorance, and prejudices have to be met by patient and prolonged discussion. The ryots are not compelled to come to you for anything, but if we are to be of any use to the country

we must see them coming voluntarily to our officers more and more. Therefore be "courteous." Also "be prompt." Agriculture knows no Government holidays. The times of sowing and of harvest are set by the seasons irrespective of the arrangements of man, and you all fully know that no farmer can afford to lose either his seed time or his harvest, and therefore if he comes to you for seed or for advice or help he wants it immediately; it is of no use giving it to him after the time at which he could utilise it to his advantage has passed. Therefore "be prompt." I will not expatiate upon the text of being "honest" because I trust all of you realise the absolute necessity for scrupulous honesty and uprightness. Next come two maxims closely allied: "BE WATCHFUL AND BE CONSTANTLY LEARNING." Many long years must elapse before we can lay claim to anything like a fairly complete knowledge of the rules and conditions which control tropical agriculture throughout the varied conditions in our Presidency. Some of you have now completed the course at this College,—but this does not in any sense mean that you know fully all the details of tropical agriculture; rather it means that you should now be fitted to learn more and observe more. If you are to be of full use to your country and for the work which you voluntarily undertake as the chief occupation of your life, it is essential that when you are in the districts, you are perpetually on the watch for new practices, new varieties of crops, new methods, new diseases, new hindrances to agricultural progress and above all for new methods or new means of increasing or improving the outturn from the soil. If the day ever comes when the bulk of the men in the Department consider that their work is complete, when they have done the actual act for which they were sent out to do, so that agricultural work becomes more and more in the nature of routine, that day will see the end of the usefulness of our Department. The last rule that I ask you to bear in mind may surprise you and that is, be business-like. I do not refer in these terms solely to those

obvious virtues of quick and prompt reply which are so frequently alluded to as hall marks of the business-man. Those are very useful and laudable characteristics and can be acquired by those who will. What I mean is be constantly studying the business-side of agriculture in the villages. It is not our object to grow isolated and wonderful plants. It is our object to improve for the ryot the monetary return for the labour he has spent upon his holding, and be certain that an improvement is really of value to him and is not merely an improvement in name. It is essential to get to know the different conditions under which he works. Not infrequently it happens that things in themselves useful, advisable and commendable from a purely agricultural point of view ought not to be recommended to ryots in certain places because on account of certain business difficulties, as for instance, freight. It would not be profitable for them to adopt them. Again sometimes improvements may only become profitable when certain existing business difficulties have been surmounted. Your duties do not stop with the mere growing of crops and plants. They extend inevitably into the ryots' methods of trade and when in your tours and out in the district, I ask you to remember this constantly and study the methods of trade. For this purpose, lectures in co-operation are now a regular feature of our course and we are much indebted to Mr. C. N. Krishnaswami Ayyar M. A., a Co-operator of Coimbatore, for giving them.

If you will endeavour constantly to carry out these rules (and it is no easy matter to do so) you need not be afraid of the traditions which you will leave behind you. You need not fear but that the Agricultural Department will continue to grow and expand in usefulness and that the demand for men will continue. This day has brought to me a very special pleasure because although I have been present at Diploma Day of the last three years yet I have never addressed such a large body of students. As it is, you very nearly fill this hall, and I sincerely hope that

As this is the best chance I have of speaking to you all, together, I wish to thank you very heartily for the kind invitation to your social gathering this evening which I accept with much pleasure. I wish you all good bye and good holiday.

The Agency bean 'Chikkudu gingalu.' On approaching a village in the Godaveri Agency the first sight which strikes one is numbers of large, irregularly-planted pillars of green foliage, in December a mass of delicate purple flowers but, in January, covered with the pods of the ripening beans. Several beans are

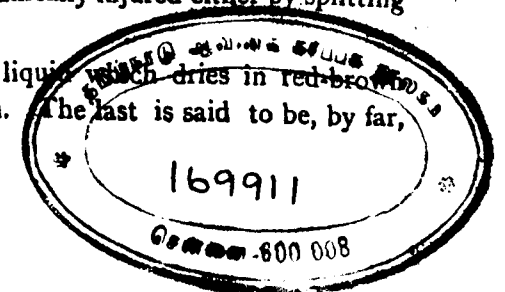
On seeing these it occurred to me that they would look well on some of those trellises in front of the quarters occupied by the staff at the Agricultural College. If they succeed, they would pass the feeding test with flying colours, besides being highly ornamental when in flower. Presumably they would be planted as a N. E. monsoon crop to ripen about January. In this hope I am sending a small quantity of seed by separate parcel.

M. E. COUCHMAN.

Sugar-cane planting machine:—The M'Nichol cane-planter drawn by 3 horses and operated by 2 men is said to be able to plant with canes from 5 to 8 acres per day. The machine drills, lays and covers the canes all in one operation. [The Australian sugar Journal April 6, 1916]. T. S. V.

Cocoanut trees and Lightning:—Though many may have heard of cocoanut trees being struck by lightning yet the actual effects of a lightning stroke may not be quite familiar. The damage thus caused may take any one or any combination of the following 3 forms:—

- (1) The crown may be set on fire.
- (2) The tree may be mechanically injured either by splitting of the stem or by defoliation.
- (3) The tree may exude a liquid which dries in red-brown streaks or patches on the stem. The last is said to be, by far,



the commonest form of damage from a lightning stroke. Liquid oozes out from the innumerable cracks which are always to be found on the rind of the cocoanut stem forming white frothy masses and running down in long red streaks. The appearance gives the impression that the whole of the internal tissues was undergoing rapid fermentation.

"When a tree has been partially struck by lightning—but not killed outright—steps should at once be taken to bleed it and the surrounding trees by boring holes at their bases with an augur".

The effect of a lightning stroke can be simulated by making a fire near the base of a cocoanut but not near enough to char the stem. When so treated red-brown patches above described appear on the stem after a short time.

One important use of the cocoanut tree is not generally recognized. Especially when wetted by rain it acts as an efficient lightning conductor over the huts which nestle under it. [Tropical Agriculturist October, 1915]. T. S. V.

Departmental Notes.

Agricultural Department.

Upper Division.

Scientific Sections.

Posts approved.

One on first grade on Rs. 200.
Two on second grade on Rs. 175,
Four on third grade on Rs. 150,
Eleven on fourth grade on Rs. 75, 75, 75-5-125.

Posts sanctioned all except one in the third grade and two in the fourth grade.

First Grade (1) Rs. 200.

1. G. Tadulingam, F. L. S.

Second Grade (2) Rs. 175.

1. T. V. Ramakrishna Ayyar, B. A., on other duty as acting Government Entomologist.
2. P. A. Subramania Ayyar, B. A.

Third Grade (3) Rs. 150.

1. S. Sundaratnam, M. A.
2. Y. Ramachandra Rao, M. A.
3. T. S. Venkataraman, B. A., on deputation at the Sugarcane Station.

Fourth Grade (9) Rs. 75, 75, 75-5-125.

Personal Scale Rs. 50-10-150.

Date of increment.

- | | | |
|-------------------------------------|---------|--|
| 1. K. Krishnamurti Rao. | ... | 1st January 1916. |
| | | On deputation at the Sugarcane Station. |
| 2. C. Narayana Ayyar. | Rs. 100 | 1st October 1915. |
| 3. T. R. Ranganath. | 90 | 18th July 1915. |
| 4. P. A. Raghunathasami Ayyangar. | 90 | 1st October 1915. |
| 5. B. Viswanath, F. C. S. | 90 | 29th January 1916. |
| | | N. B.—B. Viswanath's scale is Rs. 50-10-100. |
| 6. G. N. Rangaswami Ayyangar, B. A. | 80 | 2nd December 1915. |

Regular Scale Rs. 75, 75, on probation and then Rs. 75-5-125.

- | | | |
|---|--------|-----------------|
| 7. T. Lakshmana Rao, B. A. | Rs. 80 | 1st April 1916. |
| 8. S. P. Venkatakrishna Mudaliar, B. A. | 75 | 1st April 1916. |
| 9. P. S. Jivanna Rao, B. A. | 75 | 1st April 1916. |

Sub-Protém.

- | | | |
|----------------|--------|---|
| 1. K. Ramayya. | Rs. 75 | Sub Pro Tem for No. 1. Remains on Rs. 75 till 2 years probation in scientific work is over. |
|----------------|--------|---|

Acting.

- | | | |
|-----------------------|----|--|
| 1. P. V. Isaac, B. A. | 75 | (Vice M. R. Ry. T. V. Ramakrishna Iyer on other duty as acting Government Entomologist). |
|-----------------------|----|--|

Temporary. 50-10-150.

- | | | |
|-------------------|--------|-------------------|
| 1. Cheriyan Jacob | Rs. 70 | 11th August 1915. |
| 2. U. Vittal Rao. | 50 | 2nd July 1915. |

Agricultural Section.

	No. of posts approved.	No. which may be filled.
First grade on Rs. 200	5	1
Second grade on Rs. 175	8	3
Third grade on Rs. 150	12	1
Fourth Grade on Rs. 50-5-125	42	25

First Grade on Rs. 200 (1)

1. D. Balakrishna Murti. On other duty as a Sub-protém Assistant Director.

Second Grade (3) Rs. 175.

1. A. V. Thirumuruganatham Pillai.
2. M. Govinda Kidavu.
3. R. Ramasami Ayyar.

Third Grade (1) Rs. 150.

1. S. Subramania Ayyar.

Fourth Grade (25) Rs. 50-5-125.

Personal Scale Rs. 100-10-150.

Date of Increment.

- | | | |
|--|---------|-------------------|
| 1. T. V. Narayana Rao. | Rs. 130 | 1st June 1915. |
| N. B.—Narayana Rao's scale is Rs. 50-10-150. | | |
| 2. Rao Sahib A Rama Rao | 110 | 13th August 1915. |

Regular Scale Rs. 50-5-125.

- | | | |
|---|-----|--|
| 3. T. V. Rajagopala Achari. | 100 | 1st April 1916. |
| 4. M. Mangesha Rao | 90 | 1st April 1916. |
| (On deputation as Farm Manager, Sugarcane station). | | |
| 5. S. Ramasami Pillai. | 75 | 1st April 1916. |
| 6. M. Muthusami Ayyar. | 65 | " |
| 7. K. Narayana Ayyangar | 65 | " |
| 8. K. Unnikrishna Memon. | 65 | " |
| 9. N. S. K. landaisami Pillai. | 65 | " |
| 10. K. T. Alwa. | 50 | " |
| 11. S. Narayana Ayya. | 50 | " |
| 12. K. Raghavachari. | 50 | " |
| 13. K. Ramayya. | 50 | 1st April 1916. On other duty in the Science Sections. |
| 14. K. Gopalakrishna Razu. | 50 | 1st April 1916. |
| 15. T. Budhividehya Rao. | 50 | " |
| 16. 25 Vacant. | | |

Sub Protem in permanent vacancies.

- | | | |
|-------------------|----|-----------------|
| M. K. Nembiyar. | 50 | 1st April 1916. |
| C. V. Seshachari. | 50 | " |

Lower Division.

	Posts approved.	Posts which may be filled.
First Grade on Rs. 90	6	...
Second grade on Rs. 85	9	...
Third grade on Rs. 80	18	...
Fourth grade on Rs. 35-2½-75.	108	50

Agricultural Section.**Fourth Grade. (41).****Personal Scale—50-5-100.**

These officers will continue to draw their increments in the personal scale subject to the ordinary conditions up to Rs. 100. But whenever any of them draw Rs. 80, 85, 90, 95 or 100 that officer will be considered to be holding such a post in one of the first three grades as is nearest in value to the pay the officer is actually drawing.

- | | Rs. | Increment dates from. |
|---|-----|--|
| 1. L. S. Natesa Ayyar. | 75 | 1st April 1916. |
| 2. V. S. Narayanasami Ayyar. | 65 | 1st September 1915. |
| 3. K. Sankara Ayyar. | 65 | 1st October 1915. This will not affect the next increment which will fall on 1st September 1916. |
| 4. M. V. Raghavulu Naidu. | 65 | 1st September 1915. |
| 5. T. R. Venkasami Rao. | 65 | 1st April 1916. |
| 6. N. Sitharamaswamy Naidu. | 65 | " |
| 7. V. G. Dhanakoti Razu. | 60 | 1st June 1915. |
| 8. K. Ramanatha Ayyar. | 60 | 1st July 1915. } These |
| 9. W. Raghava Achari. | 60 | " } have |
| been confirmed as Farm Managers in the old scale of Rs. 50-5-100 with retrospective effect from 12th August 1914. | | |

Regular Scale. 35-2½-75.

- | | | |
|------------------------------|--------|---|
| 10. S. Subbayya. | Rs. 55 | 1st April 1916. |
| 11. V. S. Subramania Sastri. | 50 | " |
| 12. T. S. Venkatrama Ayyar. | 50 | " On deputation in the sugarcane station. |
| 13. G. R. Venkatachalapathy. | 50 | " |

Personal Scale. 35-3-50 until Rs. 50 is reached and then regular scale.

- | | | |
|-------------------------------|----|--------------------|
| 14. V. S. Ramasami Ayyar. | 47 | 12th January 1916. |
| 15. M. Raman. | 47 | 1st January 1916. |
| 16. K. P. Sundara Ayyar. | 47 | " |
| 17. M. K. N. Gubilar. | 47 | 12th January 1916. |
| Sub-protem in Upper Division. | | |

18. C. V. Sessa Achari.	47	31st March 1916.
Sub-protom in Upper Division		
19. C. S. Madiah	44	7th June 1915.
20. K. T. Bhandary.	44	30th October 1915.
21. T. A. Krishna Ayyar.	44	10th January 1916.
22. A. Chinnathambi Pillai.	44	28th January 1916.
23. D. Panakala Rao.	41	18th September 1915.
24. K. Ramanuja Achari.	41	31st August 1915.
25. V. Ratnaji Rao.	41	31st August 1915.
26. B. Siva Rao.	41	1st July 1915.
27. K. P. Harihara Ayyar.	44	24th August 1915
appointed temporarily for 2 years from 24th August 1914.		
28. Rajagopal G. Mal.	38	2nd June 1915.
29. M. U. Vellodi.	35	11th April 1915.

Sub Protom.

30. N. V. Viswanatha Ayyar.	38	31st October 1915.
31. M. Virarrghava Rao	35	15th June 1915.
32. S. Sitharama Patrudu.	35	18th May 1915.
33. S. Pranathartikaran.	35	1st September 1915.
34. 41 Vacant.		

Scientific Section.

Nine posts sanctioned in fourth grade 35—2½—75 besides one sanctioned for Paddy Breeding Station on 25—5 (biennial) 50 in G. O. No. 3112-Rev. dated 30th October 1914.

Regular Scale. (35-2½-75.)

		Date of Increment.
1. P. V. Raghavendra Rao.	Rs. 45	1st April 1916.
2. Muhammad Azizuddin.	25	"
3. P. Vianu Somayaji.	35	"
(Personal scale (25—5 (biennial)—35 and then Regular scale).		
4. C. Krishnan Nair.	25	19th November 1914.
5. S. Ramasami Raju.	25	1st October 1914.
6. C. S. Gopalaswami Rao.	25	28th November 1914.
7. P. Susainathan. Sub Protom.	30	22nd June 1914.
8. D. Ponnayya. "	25	12th April 1915.
9. B. V. Raghavendra Rao.	50	Appointed temporarily for 2 years till the end of June 1917.

Fieldmen on 25-5 (increment biennial)-50.

10. M. Ramaswami Pillai.	25	11th August 1915.
Temporary.		
11. R. Thomas.	30	1st November 1914.
12. G. V. James.	30	1st November 1914.
13. E. S. Pasupati Ayyar.	25	4th February 1915.

Transfers.

1. M. R. Ry., R. Ramaswami Ayyar, Agricultural Demonstrator, Agricultural College, Coimbatore, to Sirvel as Manager, Sirvel Agricultural Station.—To relieve No. 9 after the end of the current term, May 1st.

2. M. R. Ry., C. Narayana Ayyar, Assistant in Entomology to work as Agricultural Demonstrator in the Agricultural College, Coimbatore.—To take charge on return from leave.

3. M. R. Ry., K. T. Alwa, Manager of Agricultural Station, Tali-paramba, to the Agricultural College, Coimbatore as Agricultural Demonstrator.—To join at College on May 20th.

4. M. R. Ry., Unni Krishna Menon, Agricultural Demonstrator, Agricultural College, Coimbatore, to Sholavandan as Agricultural Demonstrator (on green manure introduction work).—To take over charge from No. 7. on May 8th.

5. M. R. Ry. V. Muthusamy Ayyar, Manager, Samalkoto, Agricultural Station as Agricultural Demonstrator, Tanjore District.—To join on expiry of special work at Samalkota.

6. M. R. Ry., T. R. Venkasami Row, Assistant Agricultural Demonstration, Tanjore to Hagari as Assistant Manager of Agricultural Station, Hagari.—To join on relief by No. 5.

7. M. R. Ry., K. Ramanatha Ayyar, Assistant Agricultural Demonstrator, Sholavandan to Godavari District, as Assistant Agricultural Demonstrator for groundnut propagandist work.—To join on relief by No. 4.

8. M. R. Ry., T. S. Venkatarama Ayyar, Assistant Manager on deputation at the Sugarcane Station, Coimbarore, to Koilpatti as Assistant manager.—To join on relief by No. 9.

9. V. S. Ramaswami Ayyar, Assistant Manager, Sirvel Agricultural Station to Coimbatore as Assistant Manager Sugarcane Station, Coimbatore.—To join on relief by No. 1.

10. C. Madiah, Assistant Manager, Koilpatti Agricultural Station, to Taliparamba, as Assistant Manager.—To join on return from leave.

11. K. P. Sundara Ayyar, Assistant Agricultural Demonstrator, Tinnevely District to Manganallur as Assistant Manager, Manganallur Agricultural Station.—To join on relief by No. 8.

12. M. U. Vellodi, Assistant Manager, Manganallur to Malabar as Assistant Agricultural Demonstrator for "Areca nut palm disease work.—To join in May on date fixed by the Deputy Director of Agriculture, Southern Division.

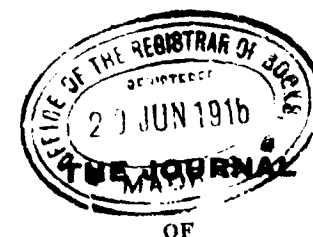
13. D. Parakala Row, Assistant Manager, Samalkota Agricultural Station to Palur as Assistant Manager, Palur Agricultural Station.—To proceed at once.

14. S. Paranarthiharan, Assistant Manager, Palur Agricultural Station to Samalkota as Assistant Manager, Samalkota Agricultural Station.—To join on relief by No. 13.

15. M. R. Ry., V. Muthusamy Ayyar, Manager, Samalkota Agricultural Station is transferred as Manager, Anakapalle Agricultural Station. To join at once. This cancels his transfer to Tanjore District.

16. M. R. Ry. K. Narayana Ayyangar, Manager, Anakapalle, Agricultural Station, is transferred as Agricultural Demonstrator, Tanjore District. To join on relief by M. R. Ry. V. Muthuswamy Ayyar.

17. E. S. Pasupathi Ayyar, Fieldman, Temporary, G. S. E's Section has been appointed as a Temporary Silk Fieldman under the Government Entomologist, in the place of B. V. Raghavendra Rao under suspension.



The Madras Agricultural Students' Union.

Vol. IV.

May 1916.

No. 5.

N. B.—Contributors are requested to send in their contributions written legibly in ink on one side of the paper only.—Editor.

Editorial Notes.

We congratulate M. R. Ry., Rai Bahadur K. Ranga Achariar Avergal, for his book on 'Elementary Botany' which is just to hand. This may be said to be the first of its kind—A Botany book for Indian students with plenty of Indian examples. Text-books of Botany there are many but they all have a foreign air about them because the bulk of the illustrations and quoted specimens are foreign. The student or the teacher has to find out the nearest Indian representative and try his best to read the Text into the specimens before him.

The present book enables the Indian student to study the subject with the help of specimens which he

constantly finds about him, in the kitchen, in the house garden or in the mute companions of his evening rambles.

Elementary
Botany.

The advantage of this cannot be over-estimated when it is remembered that it is the first specimens one studies, that produce the most lasting impressions. These form the nuclei round which the information acquired during later years, tends to gather and build up the students' knowledge of the subject. The always-available spiny-fruited Tribulus which rudely attracts our attention as we walk over fields, the Dolichos, the Pumpkin and the Plantain—the everyday inmates of an Indian kitchen—the medicinal plants of every day use such as the Melia and Gynandropsis the sacred lotus and the dear old Banyan are all laid under contribution to illustrate the various chapters of the book. The diagrams, the illustrations and the micro-photographs have nothing to be desired, the last, in particular, are so well done that one would imagine seeing the sections themselves and not their reproduction on paper. The glossary and the index giving the tamil and the telugu names of the plants dealt with, greatly add to the usefulness of the book. The get up is good and the book is available from the Superintendent Govt. Press at the low price of Rs. 2/-. We hope that the book will soon command the wide popularity which it richly deserves.

The Bombay Department has recently come into line with other Provincial Depts. in India, by recognising its arrangements for teaching. It will be remembered that

the Bombay College of Agriculture is at Poona, where a splendid building has recently been constructed on the most modern lines. The course given at Poona is different from that at any other Provincial College in that the College is affiliated to the University of Bombay, while it differs also in that its standard is possibly higher and its numbers are certainly larger than anywhere else.

The new regulations, which we have been permitted to see by the kindness of Dr. Harold Mann, who no doubt is largely responsible for the proposed changes, deal with the examination for the degree of Bachelor in Agriculture, and contain much that is of interest to us at Coimbatore. The regulations, it may be said, are not as yet approved by the Govt. of Bombay, but have been already accepted by the University.

Firstly, the intending student must as a test of general education, have done a year's work after passing his Matriculation, or have passed the Previous Examination of the University, or of course, some examination recognised as equal to it. There are two examinations in the course, the first—the Intermediate examination in Agriculture, which cannot be taken until two terms have been kept at a recognized school or College, that is at Poona. This consists of four subjects, (i) Agriculture and Geology combined, (ii) Chemistry (iii) Botany (iv) Mathematics and Physics. The Agriculture is not excessive, as it deals, according to the syllabus, with tillage, and the questions involved in the handling and use of implements of all kinds, for cultivation. Geology is much more

advanced than here, and has always been made rather a feature of the Poona course.

This passed, and it may be noted, that science graduates who have taken Chemistry and Botany as their subjects, are excused this examination, the student proceeds to two years work for the Degree, during which time he is to be unhampered by University Examinations. This course is noticeable for the fact that it includes an optional subject. Agriculture (including Vety. Science), Chemistry of Agriculture, Agricultural Botany, and Plant Pests and Diseases are the four compulsory subjects besides which a student must take an optional. This may be selected from the following five :—

- | | |
|---------------------------------|----------------------|
| (a) Agricultural Economics etc. | } as in
syllabus. |
| (b) Stock Breeding | |
| (c) Advanced Botany | |
| (d) Ag. Chemistry | |
| (e) Adv. Entomology | |

This is the novelty, and a most attractive novelty it at first seems to be. Instead of forcing all the students through one gate, each student has the opportunity to devote himself to his own special inclination, while all are taught sufficient to ensure that they shall qualify for an Agricultural Degree.

On close examination, the criticism may be made that all the subjects are not of the same value, and it will be difficult to keep the standard the same. Unless this is done, it will soon be found that one is easier than

the other and the entries for that subject will be high. This will entail difficulties in the appointment of the men afterwards. Indeed this will happen always, for it will be difficult to dispose of say three advanced Chemistry men, when the Mycologist or the Entomologist is calling for recruits. The first optional seems open to objection, as being rather a mixture of economics and engineering, the connexion between the two being through land development, largely in Bombay, a matter of bunding, well sinking and water lifting, all engineering problems.

The times allotted for the various subjects are not given, but a knowledge of the relative importance of the subject may be gained from the marks allotted to them in the examination. Agriculture etc., gets 500, 300 in Papers and 200 in Practicals, the optional subject gets 400, 300 of which is for papers and 100 for practical. Each of the others gets 100 for papers, and 100 for practicals except Plant Pests etc., in which only 50 is allotted for the practical examination. This is, we think, sound: the optional subject counts at least as much as any two other subjects except Agriculture, to which it is just inferior.

The standard is fixed at 45 per cent., of the total for a pass, and at 66 per cent for 1st class, with minima slightly below this in the separate subjects. The details of the scheme seem to have been carefully worked out. In Agriculture, for instance, we note that besides their cultivation sheets, students have to submit to the examiner, the notes of their tours, all the notebooks deal-

ing with their practical work, and a plotted survey and level book dealing with at least 200 acres of land, and gradient of at least a mile in length. Space does not permit of further examples, but we feel from a perusal of the scheme that it has the merit of being comprehensive, and at the same time sufficiently elastic to permit of individuality. We shall be glad to learn how it succeeds.

A visit to Anakapalle.

It is not exactly the time of the year to see or rather feel Anakapalle at its best, as though there is a good breeze most of the time, the sun is very hot. There are many changes noticeable in the Farm, which is now in a subcircle, under the control of M. R. Ry., D. Balakrishna Murti, the acting Assistant Director. He was manager in charge when a previous visit was paid, and it is to his energy that much of the lay out of the farm and its present improvement is due. The most striking thing about the land, is the enormous possibility of irrigation that there is, and the very slight and feeble way in which this possibility is being exploited. It is enough to make a Coimbatorean tear his hair to see a well which costs complete, only 500/-, and supplies more sweet water than can be lifted by a 9 H. P engine and 3 inch pump. The installation of this engine has led to the filling up of some five or six other small wells, from which water was lifted by the picottah,—the mhote being practically unknown in these parts,—and the value of the land thus brought into cultivation will, it is calculated more than repay the cost of the installation. There is little doubt that there are many situations in this Vizagapatam District where such wells could be sunk with equal or greater success.

The Farm Night School is an institution which owes its inception, foundation and continuance entirely to Mr. Murthi, and if volume of sound is any indication of success, there is no doubt that it is succeeding. The Telugu small boy makes more noise for his size, than any one else;—perhaps because in these backward parts where the cattle are not fitted with ropes or reins he has to do so driving much with his voice! As an excellent object on which the funds of the Union might be well spent, the foundation of similar night schools at all Government stations is suggested. The expense would not be very great: the supervision would come from the Manager or Assistant Manager in charge, and the benefits would be great. The teacher's salary would be the standing charge, and would not be much. The Union would benefit, in that its activities would be more widely diffused and not so centralised as is now the case. The buffalo is of course a much more important animal in Vizagapatam than in Coimbatore, and is largely used for all draught purposes. The best animals seem to come from Kimedi, and are said to receive at intervals an infusion of blood from wild sires. A fine Delhi or Kasi cow and her calf are to be seen at the Farm. The cow is rather a nicer looking type than the Coimbatore cows, being lighter in colour and less hairy and with rather shorter legs. The bull is said to be eighteen months old, and if this is so, is better grown than the Delhi bulls used at Coimbatore, and gives promise of being a useful animal at stud.

Anakapalle, }
May 24th. }

R. C. W.

Cotton.*

Professor Todd first expressed his pleasure in talking about cotton. He first began to study the economics of Egypt which was

*A summary of two lectures delivered by Professor J. A. Todd at the Agricultural College, Coimbatore in March 1916.

a study of the cotton crop of that country. Then he went to America the great cotton country to study the question there. The question of cotton is of particular importance to India, and especially to this district. The War made India suffer at first on account of lowering the price of her cotton. Soon after the outbreak of war prices went down but the subsequent rise was very marked. He asserted the great future of India as a world's supplier of cotton. Dealing with the statistics of the world's supply he believed that the Indian crop was much larger than what the Govt. accounts indicated. The statistics of Egyptian cotton were very correct. Chinese figures were only approximate inasmuch as no reliable data could be got. However, one thing could be said that the crop in China is also increasing. America supplies the largest quantity to meet the world's demand. Cotton is a world wide crop. Then he discussed the supplies of cotton in the various countries severally, both as regards quality and quantity.

Sea-Island cotton is the finest in the world with a staple length of 2" fetching 40 as. a lb. It can spin anything up to 2,000 counts. To give an idea of the term counts he said that a yarn of 300 counts would mean that 150 miles of it will make a lb. Egyptian is the next best with a staple length of 1½" to 1¾" fetching 12 as. a lb. With this it is possible to spin yarn 120 to 150 counts fine. They are specially strong and fine. American forms the great bulk of cotton in the market. It is 1" long in staple fetching 7 to 8 as. a lb. with a capacity of being spun into yarn 40 counts fine. Indian and Chinese cotton ¾" to ⅝" staples are valued at 4 to 5 as. a lb. in the Liverpool market. Although none of the best cottons are in India, yet the Madras cottons are the best among them. Bengal cotton is about the most inferior of all. Dacca muslins in India many years ago were made of yarns varying from 300 to 500 counts fineness. In the whole length of India he could not find any cotton that can spin anything near such counts. In 1820 Indian cotton exports to England got a great check by the improved methods of cotton ginning introduced in America while such purer cotton ousted the Indian commodity in the English market.

The modern history of cotton dates from 1894. American middling which is taken as the standard price of cotton then fetched 3 as. a lb. in the Liverpool market whereas it is now selling at 8 as. The rise has been very steady during the past 20 years in spite of increased supply as seen from the following quinquennial averages.

1894 to 1899.	3.76 as. a lb.
1899 to 1904.	5.44 "
1904 to 1909.	5.79 "
1909 to 1914.	7.16 "

In 1913-14 the price touched 7.96 as. a lb. the season's average being 7.26 as. The cause of this rise he said was to be found in the increase of demand. When a big crop came we used it all; when the crop was smaller we had to depend on the previous balance if any. To answer the question why the demand was increasing he had to say that the world is now getting into the habit of wearing clothes, and 9/10 of world's clothing material is cotton. The uses of cotton have also increased. Aeroplane sails were originally made of silk. Now they have found that cotton is more suited to it and much cheaper. After undergoing the processes of mercerising &c., cotton cloths look like silk or wool fabrics yet with one advantage that such things are individually cheaper than silk or wool. Therefore cotton fabrics of any fineness have come within the reach of the middle classes and it is the middle class demand that is the largest. 17 million bales of American cotton was the record yield in 1914 and the crop in all other cotton countries was likewise good. When war broke out the demand received a strong check. Therefore the abundant supply with a check on the demand made prices go down and the trade was in dismay. The cotton exchanges were closed and prices were artificially regulated by the exchange committees. From 7.38 annas a lb. for American middling in the end of July the price came down to 4.25 annas in December 1914. In autumn 1915 there was a rapid rise going up to 8.35 annas a lb. in January 1916.

Prices fell with the war and America held her crop much better than was thought possible. The acreage under cotton was cut short

in the whole world. In America the acreage was 15% less which with reduced manuring amounted to 30% of the usual supply. India and Egypt reduced their crops about 30% too. In 1916 the area was on the whole 25 per cent less and a bad season accentuated it. American crop was 7 million bales less. In the meantime the slackened demand also recovered. The causes of recovery were first that woollen materials had to be replaced by cotton, and secondly gin cotton for explosives was in large demand. Home demand of America and England could not be cut short. The English working man was never short of money and his demands remained the same. Japan took advantage of the bad situation and took the place of Germany and America. Consequently the standard price of cotton in the Liverpool market rose to 8.35 annas a lb. in January 1916.

Will this price last when normal conditions are regained? The present Liverpool prices are unduly inflated by the high freight charges, but this does not apply to *Bombay and New Orleans*. The price of any commodity must be high enough to cover the cost of production and leave a fair margin of profit. The highest cost of production must be taken into consideration. A, B, and C grow cotton and their cost of production and gain come to 3 as., 4 as., and 5 as., a lb. respectively. C cannot part with his produce for anything less than 5 as. If you want to purchase C's produce the price is 5 as. a lb. and if the demand requires it both A & B also get the 5 as. rate. This is a simple question of economics. Therefore taking the question of New Orleans or India, the prices are everywhere the same according to demand. Texas has the largest output of cotton and the cost of production is the highest there because the cost of labour is as dear as Rs. 5 to 10 per day per cooly to pick cotton. Therefore the Texas grower cannot grow cotton for anything less than 6 as. a lb. If price goes down he will decrease his acreage. It therefore means that the Texas price fixes the world's price of cotton as the demand requires Texas cotton. Present prices pay the Indian grower. If these prices are normal the result will be an increased acreage. India can supply the world with a million bales more of cotton if the demand comes. The average yield of cotton in India is 80 lbs. lint

per acre, 200 lbs. in America and 450 lbs. in Egypt, where abnormal cases have given up to 1200 lbs. per acre. So there is scope for increasing the Indian acreage. There are 25 million acres in India under cotton. If the production per acre could be uniformly raised by a lb. or two an acre it would materially improve the world's supply. Punjab colonies are expected to grow more cotton hereafter. India can better the quality of her cotton.

What India wants is to alter the proportion of her short and long staples. Bad seed is the first difficulty. There should be a regular system of seed distribution. Govt. help might be found necessary. As to methods of cultivation it is wrong to presume that all old Indian methods are bad because they are old. Handling of the produce is largely a faulty system. Ginning methods are bad. He emphasised the indiscriminate mixing of good cotton with the bad ones. The ginner is the merchant and the profit, if any, goes to him. Increased value of a good sample never goes to the cultivator as a means of encouragement for him to improve the quality. As to the value of cotton, length of staple and yield and ginning outturn struggle against each other in India. Therefore it is a question of a true market for good staple. To educate the grower, trader and even the Govt. in that matter, is the only means to improve the situation. This is the opportunity for India. If India fails to take advantage of it Japan, and China with her increasing output would win the race.

The second lecture dealt with the American and Egyptian cotton crops compared with Indian. The lecturer said that American cottons were so old as the Indian but the cultivation in America as a regular crop on a large scale dates from 1793. The expansion in its cultivation and improvements effected in the crop were, very great until now. The cotton area of America is unlike India a vast area in one great compact block known as the "Cotton Belt" measuring in all about 700,000 square miles. In these 37,000,000 acres are under cotton. The geographical distribution is interesting. The Atlantic States with the ports of Norfolk, Willington, Charleston, Savannah, Brunswick and Jacksonville form the most important. The Gulf States and Texas

form the next area with Mobile, Pensacola, New Orleans and Galveston as ports. Mississippi States with Memphis form the centre. Arizona and California of the western states grow cotton partially under irrigation. Texas is a prominent area by itself. The central states of the Mississippi valley are noted for their long staples. The California-irrigated area grows fine cotton. Atlantic States grow both the best and the worst samples.

Dealing with the varietal distribution he said that 1st comes Sea Island cotton (2) Georgias and Floridas. (3) Mississippi long staple. (4) Orleans and Texas. (5) Upland Georgia is the poorest. Long staple American lint measures $1\frac{1}{4}$ " in staple against Indian 1". The western area grows long staples also.

This vast area could but be of varying climates. Because they are mostly monsoon or rain crops the uncertainty of rainfall affects the yield. A heavy rain is as possible in one place as rainlessness in the other. In the Atlantic States they have to sow the cotton drills in circles to prevent the surface wash carrying away the crop. The Mississippi sometimes breaks its bunds ("lexees" as they are called) and the fields are covered by destructive floods. The difficulty in Texas is one of shortage of rain and it is the controlling factor. American cotton is a low growing plant and a rainfall during the harvesting of the bolls stains the cotton badly. Winter frosts over almost the whole area of the belt, defoliate the plants and stop their growth.

Methods of growing are good in America. The negro is not a hard worker. The cotton crop is cultivated for the first two months of its growth and left alone till picking season comes in. Rain may spoil the crop before but picking is never commenced until custom dictates that picking should start. Scarcity and high price of labour are other difficulties in America. Ploughing for cotton in Texas is quite elementary and rows of cotton have to be wide apart to admit of passing horse cultivators due to dearth of other labour. If the rows could be put closer together the total output per acre could be much enhanced.

The picking charges are about $2\frac{1}{2}$ cents per lb. or 3 to 5 as a lb. Mechanical pickers to save labour were consequently tried but they cost as much as handpicking. A successful mechanical picker which is a thing of the future will alter the position a good deal.

Marketing the crop is a mixture of good and bad handling. During the first stage picking is done very clean and ginning cleaner still. Ginning is completely done by machinery, cotton being moved through the various portions of machinery by air suction. From the waggon cotton is taken off by a tube which drops it in the gins and the lint is blown out of the gin pipe where it is pressed and baled. 45 million lbs. of lint have to be baled in a very short time and therefore the whole thing has to be speedily worked. Cotton is left on the plants very long and sometimes rain causes enormous damage to the crop in the field. The whole of the American ginning processes are a model to all the world. Only 3 or 4 men are required to work a big ginning factory.

The bales are 500 lbs. each and samples are taken by cutting holes in these big bales. Every time a sample is required a new hole is cut and it is not uncommon to find a bale full of sample holes. These are subsequently covered with sample patches when being compressed for export. These bales thus form a disgrace to America.

Both in America and India there is no through ownership of the cotton from the field to the factory. On the other hand all the Egyptian cotton is dealt with mostly at Alexandria where they make it into the best bales in the world. Each bale weighs 750 lbs. but looks no larger than the 500 lbs. American bale. The firms of Alexandria hold shares in the ginneries and presses where these are afterwards dealt with and as such it is to their interest not to spoil the commodity at all. American owner, ginner,

exporter and compressor are all different people and the interest of the one man is not considered to be the interest of the others and the result is bad handling. In the compresses it is a very quick process producing nearly 200 bales an hour working 10 hours a day. This figure, would be enough to indicate the speed with which the work is turned out.

As to insect pests in America, Boll-weevil is a new introduction from 1892. In 1913 the area affected by this pest was 300,000 square miles of the best cotton area. Some areas have been practically abandoned. Long staple cotton that takes longer to mature was the most affected. The attack is greatest in August-September when the crop is maturing. Sea Island cotton area is now touched by the Boll-weevil and the lecturer feared that this cotton might be extinct in five years. New $1\frac{1}{4}$ " staple cottons have been introduced to mitigate the evils done by Boll-weevil.

The area under cotton in Egypt is very small. Out of 12,000 square miles, the cultivable area is only about 5 million acres. Of this 1,750,000 acres, are under cotton and Egypt puts in the market 1½ million bales. This is due to the extraordinary fertility of Egypt. The area cultivated consists of the Nile delta the double strip of land along side the Nile up to 560 miles. The breadth does not exceed a mile in some cases. A third of this area is under cotton. The whole area is irrigated by the Nile. The cotton cultivation under irrigation has made Egypt one of the wealthiest countries in the world.

One hundred years ago dates the present system of irrigation which is all due to cotton. In 1820 there was no cotton cultivation at all in Egypt. A French Engineer who saw a cotton plant in a Cairo garden brought it to the notice of Mahamad Ali the then ruler of Egypt. He was much interested in doing all that he could to his country and as such took up

the question of cotton introduction in earnest. Basin irrigation—a system by which the flood water of the Nile was made to flow over the fields enclosed by bunds and drained off when the land was ready to receive the seed—was the method in vogue. It did not suit the cotton crop and therefore a perennial irrigation system had to be introduced. As a further step in this direction a barrage or regulator was put up at the head of the delta to hold the level of the Nile up so that the water may enter the various canals made for the purpose. In course of time the canals became silted up at their mouths and no water would go into them when the river is not in flood. Thus the irrigation facilities provided by the canal became precarious. A stupendous work finished at a cost of 4 million sterling was thus found unable to serve the purpose it was intended to do. In 1882 irrigation Engineers from India were sent by the British Government after the occupation of Egypt by Britain. They found a solution of the difficulty by completing the barrage to maintain the level of water during the dry months and provide a store of water for the summer days. The Azaar dam was thus erected about 550 miles up the river. When the barrage was closed and the reservoirs opened the Nile was full and the water freely ran in the irrigation canals with the result that irrigation was available at all times of the year. The cultivation area spread and the demand for water outgrew the supply. The dam had to be enlarged in 1912. In 1909 again the reverse process took place and the trouble was that there was too much of water in the sub-soil and the result was loss of £ 10,000,000. The drainage system had therefore to be introduced with facilities to pump out the surplus water at the mouth of the Nile.

The cultivation methods in Egypt are extraordinarily good. Intensive cultivation prevails throughout. Two acres is the average holding of a ryot and nearly a million ryots own less than an acre. The crop is closely planted and well cultivated.

Egypt is in a fairly good position as regards insects, but Boll-worm is known. Government intervention controls it to some extent. According to the law of the land no more old plants should remain after 31st December. Pink Boll-worm was an introduction from India. The cotton worm lays its eggs on the leaves and the remedy was to pick those leaves and burn them. Defaulters had to pay the cost of labour as the Government will get the picking done when the ryots fail to do it. Non-payment of such amounts meant imprisonment and the prisoners were given the work of picking affected leaves in another man's field and thus the pest was efficiently controlled. The Soudan crop is another smaller lot but of good quality and with great prospects. Government control the sale of seed as its monopoly, send officers round to eliminate rogue plants in any field and police men to look to clean picking. The sale was also a Government business. The result was that the price of Soudan cotton in the Liverpool market stood very high. Therefore there was justification for Government interference.

Plantain cultivation near Madras.

Sothuperumbedu is a village some 12 miles N. W. of Madras. The cultivation of Plantain is a special feature of this village, a large area being under it every year. The cultivation of plantain in this or in the surrounding villages is said to have been unknown some 20 years back and the first introduction of systematic cultivation appears to have been made by Messrs. T. R. Tawker & Sons of Madras into the adjacent village Surapet, and thence copied into Sothuperumbedu; it has since made good progress and the cultivation is now done in a very careful manner. Most of the lands in this village depend upon lift irrigation, from wells or the tank channel and the present confinement of plantain cultivation mostly to this village is perhaps largely due to its immunity from water logging, which during the heavy north-east monsoon is inevitable in the neighbouring villages.

The variety cultivated is mostly 'bontha,' or the curry plantain. This fetches a very high price in Madras at certain times of the year, when no stock comes down from Erode or the southern districts and cultivators in Sothuperumbedu are very particular of forcing their crops to be ready just in those months—July, August and September—when plantain are most scarce in Madras. Plantain is grown in rotation with paddy not oftener than once in 3 or 4 years, and treated as an annual, no ratooning being done. After the harvest of the previous crop of paddy, the land is thoroughly ploughed and weathered. Sheep are sometimes penned on the land. In the Tamil month of Adi (July—August) small pits, just enough to hold the sucker are dug out in places marked out with the plough by running it first in one direction and across again at a distance of about 6 to 8 ft. The suckers which are usually topped at a height of 2 ft. are put into these pits and filled round. They are then watered by pot and a day or two afterwards pressed round to consolidate the earth. If there is no rain, they are occasionally (about twice a week) watered by pot till the plants establish themselves. It is considered advisable to water the plants overhead, and asked as to the object of so doing, the ryots argue that the entry of water between the leaf sheaths has a beneficial effect. It is curious that the opposite view is held in some places—the Godavari District for instance—where to avoid danger of rain topping is not done in the case of suckers planted in June—July (i.e.,) at the beginning of the S. W. monsoon while those planted in November—December are usually topped. [This opposite view is shared also by the Cuddalore ryot who plants the suckers of green plantain (Paccha Vazhai.) Ed.]. Even in the case of those planted at the end of the South West monsoon a sloping cut is given in topping them so that the water may not stand on the cut surface even if any rain falls after planting. It is sometimes the practice to pen sheep immediately after planting, if this was not done before planting.

If there be no rain even after the plants establish themselves, the garden is irrigated by leading water from plant to plant in channels taking care to apply as little water as possible. The garden is also occasionally interploughed till the plants grow too tall to allow

of it. Now (i.e.,) about the end of the 3rd month manure is applied, a basketful round each tree and covered over. If now there be no rain, the whole garden is irrigated. Till the end of the rainy season the garden is, whenever the condition of the soil permits it, hoed with mammatties, the usual number of hoeings being 3. Any suckers that may be shooting forth are removed at the time of hoeing. Towards the end of the N. E. monsoon another application of manure is given. This time it is spread over the whole surface and not applied to each plant, as the roots by this time are expected to have occupied the whole space. The manure in the 1st as well as in the 2nd application is usually well-decayed farm yard manure. Though night soil (from Madras) is largely used for paddy it is not applied to plantain gardens. But it is the experience that its application to the previous paddy crop is very beneficial to the succeeding plantain garden.

After the rains cease another hoeing is given and after the soil is well dried, beds and channels are formed for irrigation. The beds are usually about 14' x 7' and are formed by throwing earth along the lines of the trees, this also serving the purpose of earthing up. At first an irrigation every 15 or 20 days is given but as the sun's heat increases, it is more frequent, and in the hot summer, the garden needs irrigation once a week. A further hoeing or two are given after the re-commencement of irrigation and before the throwing out of bunches, which generally begins in the tenth month if the garden is well cared after. Cutting of bunches may be begun in the twelfth month and completed in the thirteenth, but it is not unusual that some gardens, owing to insufficient manure, hoeing or irrigation, stand over for 18 months even or more.

If the bunches are all out in July—August (i.e.,) before the end of the 10th month a very high price is realised for the produce, the usual rate at this time in Madras being 1½ to 2 Rs. per 100 plantains. There will be about 900 trees to the acre if the average distance is assumed to be 7 ft. and about 800 of these may be expected to bear saleable bunches. Each bunch may consist of 50 plantains on the average and if the price is taken to be 1½ Rs. per

100, an amount of Rs. 600 can be realised by the sale of plantains alone.

Shortly before the trees begin to bunch two suckers are allowed to grow in each stool and the leaves of these fetch about Rs. 100. In fact the right to cut leaves from suckers is sometimes leased out for a higher amount. The flowers (infertile portions of the inflorescences) stalks of inflorescences within the leaf sheaths fetch another 20 to 30 Rs. The suckers if there is demand fetch another 20 or 30 Rs., the total income for all items in the case of a well grown garden thus reaching Rs. 750. The expenses of cultivation may be estimated at Rs. 250 per acre and there will therefore be a net profit of Rs. 500.

If however there is delay in the bunches being ready, the rapid fall in prices, due to the flooding of the market from other centres seriously affects the receipts. After the end of September only half the amount can be realised for the plantain, even if the yield is equally good but as the yield is also generally poor the margin of profit is often reduced to Rs. 100 or 150. It is therefore only the cultivator that can command the necessary labour, manure, and water facilities in time and thereby force an early crop, can reap the full advantage of the high rates in the Madras market.

The attention and care which some of the well to do land lords of the village pay to their plantain garden and the perfect method of cultivation evolved within about 15 or 16 years by local experience, are very remarkable. In the northern circars the system of planting plantain closely and treating it as an annual crop like sugarcane is unknown. The usual distance of planting there is 14 ft and two suckers are planted in each place. By occasional interploughing and irrigation the garden is kept on for 3, 4 or over a larger number of years. The yield is generally good in the second year but the average for the whole period is generally poor and the annual profits do not amount to more than a hundred Rupees. The system of close planting may advantageously be tried in the circars. It was tried in the Pittapuram Estate farm by the writer in a modified form some years ago and found a success.

It may also be noted that the 'Bontha' plantain generally useful only as curry stuff, is more paying in places near Madras, than the Poovan and other varieties used as fruit, for there is greater import of the latter from the mofussil, at all seasons.

It is also to be pointed out that in Sothuperumbedu no necessity for propping trees in bunch is generally felt, the trees, perhaps owing to their being single, not growing very tall, and the constant watering in summer maintaining the rigidity of the so called stem.

G. JOGIRAJU.

Notes.

Tobacco curing in Java.—Experiments were carried out in a drier, heated by a wood stove and aerated by a horizontal electric-fan. In spite of the provisional plant, it has been shown that if the temperature and moisture are well regulated in the interior of the drier the curing proceeds normally and the flexibility of the leaf is maintained to the end; the chief condition of success appeared to be the hermetic closing of the drying shed. It was found that the air could be kept moist by passing it through a series of pieces of sufficiently thick cloth continuously steeped in water; sprayers gave no results. The experiments will be repeated in a more scientific manner to discover whether it is possible to regulate the process of tobacco curing.

It was to be expected that during the first period of curing (while assimilation and respiration are still going on in the detached leaf) light would have some effect upon the process, and consequently upon the product and during the second period (while the leaf is changing colour) light might also play an important part in the little known alterations that take place. Very careful experiments, however, made both in the ordinary drier and in the laboratory have revealed no difference in the quality or colour between leaves dried in darkness of those dried

in day light or green light. It therefore seems unnecessary to illuminate the drying apparatus with green light or to keep it in the dark as is nearly always done. (Experiments by Mr. Jensen. Bulletin of the Inter. national Inst. of Agriculture—Extracted. K. U. K. M).

Indian Jute Industry formed the subject of a recent lecture by Mr. C. C. McLeod before the Royal Society of Arts and now published in the Journal for December. The publication in addition contains numerous illustrations showing the various stages of Jute Industry commencing with the cultivation. In Bengal, Cooch Behar and Assam over 3½ million acres are under Jute. It was not till 1855 that the first Jute mill was started in Calcutta and now the Calcutta mills turn out about 3,000 tons of manufactured goods a day. (Extract K. U. K. M.)

Purifying water.—A simple method of purifying almost any infected water needed for drinking without boiling it, has been worked out by Dr. G. G. Naismith, Director of Heath Laboratories of Toronto, Canada, and Dr. R. R. Graham, Assistant Chemist. The process is as follows:—Add a teaspoonful (not heaped up) of chloride of lime (costing about 6 d. a half pound bottle), containing about one-third available chlorine, to a cupful of water. Dissolve and add in any convenient receptacle three more cupfuls of water. Stir and allow to stand for a few seconds in order to let the particles settle. This stock solution, if kept in a tightly-stoppered bottle, may be used for five days. Add a teaspoonful to two gallons of the water to be purified, stir thoroughly in order that the wet chlorine solution will come into contact with all the bacteria and allow to stand for 10 minutes. This will effectively destroy all typhoid and color bacilli or other dysentery producing bacilli in the water. The water will be without taste or odour and the trace of free chlorine added rapidly disappears.

[From inquiries made in Brisbane, we can state that the above can be thoroughly recommended, the only caution given by the Government Analyst's Department being against the tendency to use more of the chloride of lime than is prescribed, which may impart an undesirable taste. Use less rather than more.—Editor, "The Australian Sugar Journal".]

Water containing mud in suspension is easily clarified by dropping hot wood ashes into it, or by the application of lime or alum. These two latter substances make the water hard. Chloride of iron may also be used. It is quite harmless, and a valuable constituent for all animals. Medical men prescribe iron in one of its several forms as a tonic. One pound of chloride of iron (2d. per lb.) will clarify 1,000 to 2,500 gallons of muddy water, and much reduce the bacterial contents. [The Australian Sugar Journal Page 680.]. K. K. R.

The Tomato:—There is no doubt that the tomato is indigenous to America. Exactly where it originated is a mooted question. The name seems to be of Aztec origin, given by some as "tomatl" and by others as "xitomate". The word still exists in names of Mexican towns, such as Tomatlan, Tomatepec, &c. Humboldt states that the plant was cultivated for its fruit by the Mexican natives long before the Spanish conquest, while Alphonse deCandolle, in his "origin of cultivated plants" arrives at the conclusion that the plant and its culture for edible purposes originated in Peru, and thence spread to other sections of the Americas. At any rate, it had been known and cultivated extensively in these countries for centuries before the Columbian discovery, and there is little doubt that many of the plants seen and described by the European invaders as wild species were really cultivated varieties originated by the Indians by crossing of selected species. Botanically the common tomato belongs to the order *Solanaceae* and the genus *Lycopersicum*, the species which is usually cultivated for food purposes being named

Esculentum. The designation of the genus, derived from *Lykos*, a wolf, and *perica*, a peach, had its origin in the supposed aphrodisiacal qualities and in the real beauty of the fruit of the vegetable. (Bulletin of the Pan-American Union). W. R.

Departmental Notes.

The following promotions are ordered with effect from 1st April 1916—vice M. R. Ry., D. Balakrishna Murti Garu, 1st Grade Manager of Agricultural stations on other duty as Sub-Pro Tem, Assistant Director of Agriculture.

M. R. Ry., A. V. Thirumuruganatham Pillai, Manager of Agricultural Stations, 2nd Grade (Rs. 175) to 1st Grade (Rs. 200) Sub-Pro Tem.

M. R. Ry., S. Subramania Ayyar, Manager of Agricultural Stations, 3rd Grade (Rs. 150) to 2nd Grade (Rs. 175) Sub-Pro Tem.

M. R. Ry., C. Narayana Ayyar, Agricultural Demonstrator 4th Grade to 3rd Grade—Rs. 150—Sub-Pro Tem. with effect from May 1st 1916.

V. Ramanatha Ayyar, L. Ag. of Nambodu, Wandiwash, North Arcot is appointed Assistant Demonstrator on Rs. 35 on probation and is posted to Palur.

R. Swami Rao of Madanapalli is appointed Assistant Demonstrator on Rs. 35 on probation and is posted to Hagari. To join on or before May 21st.

P. V. Raghavendra Rao, Sub-Assistant in Economic Botany is transferred to the Central Farm as Assistant Manager of Agricultural Station, with effect from June 15th. Assistant Manager K. Ramanujachari is transferred to the Paddy Breeding Station as Sub Assistant in Economic Botany from the said date.

The undermentioned officers are granted privilege leave for the periods noted against their names.

M. R. Ry., M. Mangesha Rao, Manager of Agricultural Stations, Sugarcane Station, Coimbatore.—3 months from the 10th June 1916.

M. R. Ry., K. Ramiah, Manager of Agricultural Stations and Sub-protem Assistant in Economic Botany.—One month from or after the 15th May 1916.

M. R. Ry., T. R. Venkasami Rao, Assistant Agricultural Demonstrator, Tanjore District under orders of transfer to Hagari, Bellary.—6 weeks from date of availing.

N. V. Viswanatha Ayyar, Assistant Manager, Palur Agricultural Station.—One month from date of relief.

K. M. Jacob is appointed Assistant Demonstrator on probation and posted to areca palm work in South Malabar.

The undermentioned officers of the Agricultural Department are granted privilege leave for the periods noted against their names.

M. R. Ry., Y. Ramachandra Rao, M. A., Acting First Assistant to the Government Entomologist.—One month from 7th May 1916.

M. R. Ry., S. Sundararaman, M. A., First Assistant to the Government Mycologist.—One month from 26th April 1916 with permission to prefix the Easter holidays.

M. R. Ry., B. Viswanath, F. C. S. Assistant in Agricultural Chemistry is granted 15 days' privilege leave from the 5th June.—To proceed on leave from the Krishna District and to rejoin duty there.

The following transfers are ordered. This supersedes orders previously issued.

M. R. Ry., Mangesha Rao, Manager, Sugarcane Breeding Station, Coimbatore in granted 3 months privilege leave from June 3rd not 10th as originally granted in R. Dis. 209/3—6—16.

M. R. Ry., K. Unnikrishna Menon is posted to the Sugarcane Station to relieve M. R. Ry., M. Mangesha Rao.

M. R. Ry., K. T. Alwa will relieve M. R. Ry., K. Unnikrishna Menon on June 2nd.

Assistant Agricultural Demonstrator M. R. Ry., K. Ramanatha Ayyar will remain at Sholavandan.

On return from leave, Assistant Manager M. R. Ry., T. B. Venkasami Rao, will take charge of Sirvel from V. S. Ramasami Ayyar.

The chain following V. S. Ramasami Ayyar's transfer holds. Vide D. Dis. 191, dated 8th April 1916.

M. R. Ry., K. Ramanatha Ayyar is posted as Assistant Agricultural Demonstrator, South Arcot and is to report himself at Palur farm forthwith.

M. R. Ry., C. V. Seshachari, Agricultural Demonstrator is transferred to the Sugarcane Station Coimbatore as Manager to relieve M. R. Ry., Mangesha Rao, on June 19th.

M. R. Ry., Mangesha Rao, Manager, Sugarcane Station is granted 3 months leave from date of relief.

M. R. Ry., V. S. Narayanaswami Ayyar, Assistant Manager of Agricultural Station, Central Farm, Coimbatore, is granted one month's privilege leave from 1st June 1916.

K. S. Sankara Pillai of Palamcottah is appointed to act.

M. R. Ry., S. R. Venkatakrishna Mudaliar B. A., Assistant in Mycology is granted privilege leave for one month from 29th May 1916.

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N. B.—Contributors are requested to send in their contributions written legibly in ink on one side of the paper only.—Editor.

Editorial Notes.

We are glad to note that Mr. K. R. Sankaranarayana Iyer an ex-student of the College and Manager Pudukota State Farm, is doing good work.

On his advice one Mr. P. M. Danappa Pillai of the State sowed 20 M. M. of paddy against the usual 50 or 60 M. M. in one nadugai of nursery. The seedlings he transplanted singly in 8 nadugais or $1\frac{1}{2}$ acres. The seasonal rains failed and the yield was very poor. Still, he got $37\frac{1}{2}$ M. M. per nadugai whereas the yield of the adjoining fields transplanted in the usual way ranged from $n\frac{1}{2}$ to 13 M. M. The ryots of such fields struck with the advantage of single planting, have promised to adopt only this method, next year.

The same ryot used to get every year 80 Rupees worth of green leaves for his land of 12 acres. He sowed wild indigo at 4 M. M. per Rupee and finds that he had a saving of 73 Rs. as his expenditure was only in the purchase of seed for which he paid 7 Rs.

The Vizagapatam District Agricultural Association drawn from all classes of people appears to be active. About the middle of the month it had a general meeting at the Anakapalle Farm, when the Assistant Director of Agriculture, Northern Division, was present and is said to have given several practical hints and useful suggestions for the better working of the Association. The Association resolved to send fairly intelligent working coolies to be trained on the Farm for some definite periods and to hold their general meetings as far as possible, at the Agricultural Station, Anakapalle, as this would enable them to formulate a practical programme of work.

We have just received a copy of the report of the tenth "Annual Cattle Show" of the District Agricultural and Industrial Association, Madura and Ramnad, held in April last, and we thank the Hon: Secretaries for the same.

The Show was run on the 18th, 19th and 20th Insts. and was opened by Rao Bahadur W. L. Venkatramiah, District and Sessions Judge of Ramnad. The Deputy Director of Agriculture, Southern Division, Trichinopoly, took keen interest by arranging for pot cultures, and samples of cotton to be exhibited, a paper on cotton to be

read and by taking part in the judging of cattle. The Veterinary Department was represented by the Inspector of the VIIth Circle who read a paper on "Cattle Hygiene." The Department of Industries contributed its quota through its representatives Messrs. Narayana Murthi and N. Subramania Iyer who read papers on "Oil Pressing" and "Cotton Weaving" respectively. The Chief Inspector of the Department of Co-operative Societies who was also present, pleaded for the formation of Co-operative business societies, such as Agricultural Cattle insurance &c. There were also speeches on "Cattle Breeding," "Monsoons," "Social Service League" and a paper on "Sugarcane."

The Cattle Show as can be made out by the remarks of the Judges was poor in every way. It is hoped that the educated ryots at any rate will take to heart the remarks of the Judges and make the Show next year, more successful and better representative of the different kinds of animals. The Show Committee are to be congratulated on the papers read, most of which as judged by the summaries are well worth perusing.

The College was re-opened after the mid-summer vacation on the 7th. The new class I has been formed of students selected at the preliminary examinations held for the candidates from the Circars, at Anakapalle, towards the end of last month and for those from the remaining districts, at the College during the first 5 days of this month. The selection was rigorous and the class is promising. The class for the new Diploma course consists of

the first eight candidates who came out successful at the last "certificate" examination.

The spread of Mauritius Sugarcane in South Canara.

In South Canara, Sugarcane cultivation is mostly confined to river banks along the mouths of rivers and to small islands known as "*Kudurs*" which lie near the mouths of these rivers. All along the coast of the district in Kasaragod, Mangalore, Udupi and Kundapoor Taluks, local sugarcane cultivation has been going on for many years, but there is not much cane cultivation in the interior taluks of Karkal and Uppinangadi. The cultivation, generally speaking is not in the hands of indigenous cultivators of the district such as the Bunts, but it is mostly done by Roman Catholic Christians and Moplahs, the latter cultivators being found only in Kasaragod Taluk. These two classes of people are hardworking and enterprising. It is these that almost monopolise the new industrial crops of the district, such as Tobacco, Sugarcane, Flowers and Fruits. South Canara is very largely a paddy growing district and the indigenous cultivators are mostly engaged in paddy cultivation. Christians and Moplahs are not, however, the original cultivating classes of the district. Such being the case, the fact as to whether sugarcane is an indigenous crop of the district, (for it is an entirely new crop to the neighbouring district of Malabar) and how and when it was introduced into the district are matters of interest. These more enterprising and colonising spirited classes of people have taken this crop from the coast to the plains where excellent crops of cane may now be seen.

There are several varieties of canes grown locally which were grown for many years before the Agricultural Department became interested in the cultivation practices of this tract; these include Namakabbu, Narikabbu, Dasakabbu, Hullukabbu and Rastalikabbu, but Namakabbu and Dasakabbu are the most common. About seven years ago the prospect of sugarcane cultivation in the district was

very gloomy. Many ryots were wont to give up sugarcane cultivation and on enquiry it is found that the following are some of the reasons:—

(1) The crops did not pay in proportion to the care bestowed on it. (2) The crop was getting diseased and degenerated. (3) The price of jaggery was falling. (4) The damage done by jackal and other pests was serious. (5) The difficulty of getting fuel for preparing jaggery was great. Those who continued planting sugarcane did so not so much for the profit to be derived from the jaggery obtained as for the sugarcane trash which was largely used for litter in their loose box system of collecting cattle manure; for thatching their cattle sheds and outhouses; and for fuel for boiling their paddy. Each ryot used to cultivate small plots, quarter to half an acre in extent, and would make very little profit by extracting the juice. Along the coast line near the mouths of rivers fuel and litter difficulties are keenly felt.

Officers of the Agricultural Department then toured in the district and attempted to introduce Red Mauritius sugarcane. In the earlier stages of its introduction these officers had to encounter considerable difficulty in gaining the confidence of the ryots and in getting them to appreciate the merits of this variety of cane. The Department was a new one to the ryots and they could not understand its aims and objects and looked upon its efforts with suspicion. Although at the beginning sugarcane setts were supplied free of cost, ryots refused to plant them fearing that the Government had in view the imposition of a new tax. There were instances where for this reason a whole village revolted against a ryot who planted Mauritius sugarcane. It was only by dogged perseverance that the officers concerned eventually won the confidence of the ryots and succeeded in starting a few plots of Mauritius sugarcane in the district. Its cultivation was taken up earlier in Udupi and Kundapoor Taluks than in Mangalore Taluk. In the Mangalore Taluk it was the custom for every cane cultivator to prepare his own jaggery, whereas in Udupi and Kundapoor Taluks at least some of the cultivators sold their crop to professional jaggery makers. These professional jaggery makers were among the first to be induced to purchase iron mills which can

easily crush the hard rinded Mauritius canes. This is one of the reasons why in Udipi and Kundapoor, Mauritius cane spread quickly in earlier years. In Mangalore Taluk ryots found it difficult to mill this cane with their wooden mills; so they had to be induced to purchase iron mills before the spread was appreciable. Ryots were poor, holdings small, the principle of co-operation was foreign to them; so they would naturally think twice before investing in an iron mill which costs from Rs. 70 to 80. At that time such mills were not known to these ryots and their efficiency was very much doubted. Officers of the Department in course of time succeeded in inducing some of these ryots to purchase iron mills. With the spread of iron mills Mauritius cane also began to spread. Heavy corps of Mauritius cane and an efficient mode of extracting juice brought to light another difficulty. The old method of preparing jaggery in small pans over imperfect hearths entailed unnecessary labour and expense. The primitive method commonly employed was inadequate to cope with the large amount of extra juice. Fuel difficulty was keenly felt in these sugarcane localities and it stood in the way of extension of cane cultivation. By using their imperfect hearths and small pans, ryots were wasting much fuel and the cost of fuel was a big item in the preparation of jaggery. It had to be purchased at a high price and brought from long distances. The Department then decided to demonstrate to sugarcane growers the construction of improved furnaces and of big flat bottom iron pans. They were shown that jaggery could be prepared by using sugarcane trash and megass with the aid of only very little additional fuel.

The work of the old fashioned wooden mill was very imperfect and much juice remained in the megass. The iron mill can extract nearly 20 to 25 per cent more juice than the wooden mill. The improved furnace and big pans effected a considerable reduction in the amount of fuel and labour required for jaggery making and this improvement gave an impetus to the spread of Mauritius cane. Without the least hesitation it can be stated that with an improved furnace and a big pan a ryot can save as much as Rs. 5/- in every candy of jaggery prepared. These improvements brought in immense

profits to the ryot and his attitude soon changed, although in the beginning he presented a stern attitude towards the suggestions of the Department. For the first five years the spread of Mauritius cane seemed to be making slow progress, but the energies of the Department were well spent in overcoming the prejudices of the ryot. The work of the Department does not end here, and no pains are spared in teaching the ryot improved methods of planting, manuring, draining, weeding and earthing up his canes; and where the confidence of the ryot has been won, the advice given is readily taken.

South Canara District is peculiarly well suited for sugarcane cultivation. As the district has a very good rainfall, irrigation is necessary only for three or four months during the period of growth. The planting season commences in December and continues up to April in different taluks of the district. Watering is only necessary from the time of planting till the south west monsoon breaks in June; afterwards no irrigation is necessary till harvest. The earlier the planting the better the yield. If the crop establishes itself before the heavy monsoon downpour, it withstands the rain better and gives a very good yield. Mauritius cane is not only replacing the local cane, but also new areas are coming under its cultivation. Paddy cultivators are now appreciating the profits to be derived from sugarcane cultivation and are beginning to cultivate it in their single cropped bettu or majulu lands which have the necessary water facilities. Last year one ryot at Kankanady village planted Mauritius cane in about 10 cents of bettu land and got 2 candies of jaggery which was sold for Rs. 100/-. If it were paddy he would not have realised even Rs. 10/- from the same area. A difference of Rs. 90/- in 10 cents should convince the most conservative of ryots. This year the same ryot has extended his Mauritius cane cultivation to about 40 cents. After realising such a substantial profit, this ryot repeated to me the proverb "that the sweetness of jaggery is not known to all." By that he metaphorically meant that the large profits to be derived from sugarcane cultivation are known only to those who actually cultivate it. Paddy cultivators find it difficult to find work for their permanent labourers during the slack season,

but if sugarcane cultivation is adopted this difficulty can easily be overcome. Where there are no water facilities, it would pay ryots considerably better to invest their money in digging wells near their bettu or majalu lands and grow sugarcane, instead of continually taking up for cultivation unprofitable new lands. Records regarding the area under Mauritius cane for the last 3 years show a steady and rapid spreading of this cane in the district. In 1912—13 it was 84 acres, in 1913—14 it was 194 acres in 1914—15 it was 425 acres and in 1915—16 it might have gone over 600 acres. The total area under cane in the district is a little over 2000 acres of which 600 acres are under Mauritius cane. Not only is the area under Mauritius cane spreading but this is also the case with the total area under cane. Most of the Mauritius cane is found in Mangalore, Udipi and Kundapoor Taluks, but work has just begun in Kasaragod and Uppinangady Taluks and there is every prospect of its spreading in these taluks also. A comparison between the outturn of jaggery per acre as obtained by old methods and as obtained by improved methods is appended.

A. Old method.

The ryot grows local sugarcane; uses the wooden mill; and prepares jaggery in the same wasteful way as did his ancestors.

Outturn by the old method.

8 candies of jaggery at
Rs. 50/- Rs. 400/-

There is a difference of Rs. 350 per acre in the gross profit, whereas the additional expenses incurred in adopting improved methods are within the scope of every ryot.

The above yield is from an average crop of Mauritius cane, but good and careful cultivators get 18 to 20 candies per acre thereby

B. New method.

Another ryot grows Mauritius cane; uses an iron mill; constructs his furnace so as to use as little fuel as possible; and prepares jaggery by the improved methods recommended by the Agricultural Department.

Outturn by the new method.

15 candies of jaggery at
Rs. 50/- Rs. 750/-

realising at the present high price of jaggery about Rs. 1,000 per acre. There is no crop so profitable as Mauritius sugarcane for South Canara ryots who have the facilities for growing it.

The economical method of jaggery preparing has solved the fuel difficulty which was standing in the way of the extension of cane cultivation in the district. Hard rinded Mauritius cane is well suited to the hilly district of South Canara where jackals are causing much damage to soft rinded local canes. In addition to 600 acres of Mauritius cane which was originally supplied by this Department, grown in the current year, there are over 150 iron mills in the district and the old method of jaggery making is becoming a thing of the past.

The Arecanut Palm in Malabar.

The arecanut or betelnut is the most beautiful of the palms. Its long, straight stem and graceful green leaves are sure to arrest the attention of any passer by. In regard to its utility it is not an unimportant plant. In Malabar the uses to which the palm and its produce are put are many. The trunks of old trees are used as reepers and beams in the construction of houses and sheds. The leaf sheaths are made use of in various ways for making caps which the Malabar coolies wear during day time, for making baskets to bale out water from wells and as ropes in thatching houses with coconut leaves. From the leaf-lets are made brooms. The nut is well known and there is hardly any Indian house where it is not used on ceremonial occasions. It has very valuable medicinal properties.

The palm is distributed all over Malabar but nowhere is it so extensively cultivated as in the red soil tract of the Ponnani Taluq where a total area of 10,577 acres was recorded in Fasli 1324. The high lying paddy fields and valleys of hills are being converted into areca topes every year and the cultivation is therefore on the increase.

It is propagated by seed. Ripe nuts are gathered from old trees and are kept in shade for a few days before sowing. Seed beds are

dug well, a fine tilth is obtained and powdered cowdung and ashes are applied. The nuts are buried a foot apart and watered on alternate days. The germination takes place in 45 days. The seed beds must be clean from weeds. The seedlings are fit for transplanting when 2 to 3 years old.

The land selected for the plantation is cleared of all vegetation. Holes $2\frac{1}{2}$ ft. deep and $2\frac{1}{2}$ ft. by $2\frac{1}{2}$ ft. are dug at intervals of 6 ft. to 8 ft. sometime before the North-East monsoon ceases and the land gets hard. During the hot weather the holes are partially filled with rubbish, which is burnt to ashes. Seedlings are planted in April-May, June-July or November. The June-July planting is more universal. When the plants grow to 25 years old second planting is done in the inter-spaces to keep the plantation going.

This palm readily responds to liberal manuring and the produce shows the care bestowed on it. No initial manuring is given. Some cultivators manure their gardens on three occasions i. e. in July, November and March. The second manuring is very often neglected. A mixture of green leaves, cowdung and ashes is the manure used the quantity increasing with the age of the plantation. The difficulty of manuring is increasing as the supply of green leaves has been getting less and less. This defect may be remedied by raising a green manure crop before the South-West monsoon is in full swing. This serves an additional purpose of keeping down weeds also which spring up luxuriantly in the season.

Irrigation is an important item. It is expensive and laborious. It begins in December and is continued until the monsoon becomes regular. Irregularity in irrigation results in the shedding of nuts. The usual water-lifts in vogue are the picotta and the mhote. The former is used in small gardens of 500 trees or less and in big gardens the latter is in use.

The picotta is so fitted that 2 buckets can be worked at the same time. A bucket holds about 6 gallons of water. Two men for lifting, one boy or girl for guiding water are necessary and the work is done on contract at Rs. 5/- per mensem.

The construction of the mhote does not differ from that found at Coimbatore. But the wood and masonry works are not so substantial. The bucket is cylindrical in shape, is made of iron and has a leather mouth piece. The bucket varies in size with the cattle working. In some villages where good cattle costing Rs. 150/- to Rs. 200/- a pair are maintained buckets with a capacity of 20 to 25 gallons of water are used. Cattle are seldom available for hire for this work. Wells in these tracts are shallow, never more than 30 ft. deep and 10 ft. wide. A good well of this size costs Rs. 30/-. Even in the hottest part of the year most of the wells do not fail.

It is a very common practice to grow plantains between young arecanuts to provide shade. This crop gives an earlier intermediate return which helps in keeping down to some extent the cost of cultivation of the areca trees until they are able to pay. Also betel vine is trained to grow on the trunk of this palm and this is an extra source of profit to the owner.

The arecanut begins to bear in the seventh year of its planting and only in the tenth year it comes to full bearing stage. It bears for 45 years and may live 80 years or more. It flowers in February and in every month till July a flower spathe is thrown out. There will be 4 to 5 bunches of nuts on each palm and in a few cases 7 bunches even. A good bunch contains up to 400 nuts the average being 75 to 100 nuts. Thus a tree yields 300 to 400 nuts annually. The first picking commences in June, a few nuts being ready. Later the nuts increase in number with every picking. The bulk of the harvest takes place in October. Harvesting wages are paid in kind 2 nuts being given for every bunch plucked. An able bodied cooly will climb 100 trees in the busy season and earn about 400 nuts valued at 8 to 12 as. In a pretty old plantation harvesting is easier than in a young plantation that has just begun to yield as the climber in the former case can reach tree after tree by swinging.

The garden owner husks the nuts before he takes the produce to a market. A cooly gets 4 to 5 palms (1 palm=15 Re. weight) for every maund of husked nuts. About 1,500 shelled nuts weigh a local

maund of $37\frac{1}{2}$ lbs. A similar weight of dry nuts sells at Rs. 10/-. 3 maunds green are reckoned as equal to 1 maund dry. The process of preparing the nuts is done by merchants. There are several centres for this trade and the chief of them is Chalanin. The green nuts are sliced into different shapes and sizes to suit the requirements of different buyers of several purchasing centres and boiled and dried.

The cultivation charges for 500 trees for the 1st year will come to Rs. 90/- and later the amount will not exceed Rs. 60/-. Investment in the areca plantation is profitable as in normal years a block of 500 trees yields an annual profit of Rs. 250. But this palm like most other cultivated plants has its enemies too and in recent years the out-break of a most invidious disease popularly called "Mahli" is causing very severe loss to the garden owners. Some of the land owners who depend upon this crop for their maintenance have been brought to the verge of ruin on account of the continuous attack of this disease for a number of years. This disease is due to a fungus which enters into the green nuts and spoils them. This occurs during the heavy rains of June, July and August. Several remedial or preventive measures seem to have been tried of which the most recent and generally successful one is the spraying of the Bordeaux mixture on the cluster of nuts. Spraying has been done in several affected localities and still the practice has not spread to other places where the attack is very general. One may ask why? One reason is that the spraying has to be done on a clear day when the cultivator can be sure of a bright sun. Another reason is that during the spraying season the cultivator is out of funds and finds it difficult to employ labour. The first depends on circumstances over which the worker has little control. The latter is possible provided that there is organised effort on the part of the intelligent and willing ryots working in a body. This can be done through co-operative societies with this object in view where the members can buy a sprayer or two and a few chemicals for the purpose. Another way in which the society could be useful is in dispensing with the necessity for the present middlemen—the mopla merchants—who keep running accounts with

the growers by supplying them with necessities and small luxuries from time to time and recovering the value in the shape of arecanuts at harvest time, of course at reduced rates. This deprives the arecanut growers of what profit they could otherwise get and keeps them always in a state of indebtedness to the moplas. If big merchants could in their own interest be more considerate and extend their sphere of beneficial influence over the growers direct by stocking chemicals and sprayers advancing what little is required by the growers at reasonable rates, they will get nuts of better and uniform quality which will ensure stability in trade.

M. K. NAMBIAR.

The principles of crop production.*

Up to 1840 farmyard manure held undisputed sway as a fertiliser. It was known that plants contained metallic constituents, and that certain metallic compounds were useful fertilisers, but in as much as organic matter was the chief constituent of plants, it is believed that organic manures must be the best. In 1840, Liebig taught that the true function of a manure was to provide mineral matter, the nature of which was to be deduced from the composition of the plant ashes. His prescriptions failed completely in practice; and the Rothamsted experiments showed that he had overlooked the role of nitrogen, and that the composition of the ash of the plant was no guide to the soil amendment required in any specific case. When artificial fertilisers were first introduced, it was maintained that the fertilising effect would not endure but experience disproved this, and experiments for over 60 years at Rothamsted have shown that good crops can be grown almost indefinitely by supplying sufficient nitrogen, phosphorus, and potash. Plot experiments by Wille in the sixties disclosed the nature of the fertilising elements required by a given soil, but his work was purely

*Lecture delivered before the Chemical Society by Dr. E. J. Russell.

empirical, and scientific agriculture marked time till Schloesing and Muntz discovered that the nitrification of the ammonia in sewage was due to specific bacteria. This discovery opened up the highly important hinterland of soil bacteriology. Weathered subsoil contains little plant food, but supports a certain flora which when it decomposes yields nitrates, humus, lime, etc., as endproducts; and these furnish the conditions necessary for the existence of bacterial life and for soil fertility. Scientific agriculture controls the decomposition by adjusting the air supply, water, temperature, etc., by securing the presence of beneficent organisms, and by maintaining the supply of plant residues. Fallowing and ploughing in are almost prehistoric operations; in modern practice a special crop, e. g., clover, mustard, lupines, vetches, is grown and ploughed in, or brought back to the land as farmyard manure. The loss of nitrogen due to denitrification, which occurs particularly on prairie land and in soil intensively cultivated, has been traced to the hydrolysis of proteins by bacterial agency. In well-covered manure heaps the anaerobic conditions prevent loss of nitrogen, but so soon as air is admitted the loss proceeds apace, not as ammonia, but probably as free nitrogen. In the farmyard the loss is increased by leaching, and altogether millions of pounds sterling are lost annually from these causes. Such biochemical changes are affected by minerals, e. g., lime, by the physical texture of the soil, and by the crop; the growing plant apparently retards nitrification since more nitrate is formed in fallow than cropped land, even after allowing for the nitrogen assimilated by the crop. Whitney, in his studies of tobacco culture in the United States, traced the connection between good growth and "soil climate," (i.e., moisture, temperature, etc.,) by correlating these factors with the sizes of the soil particles; hence, the value of the mechanical analysis of soils. The factors which favour plant growth are so related that the good effect of any one of them ensues only when every other factor is operative. The failure of one factor affects the

growth, even when the others are present in increased measure, and a stage is finally reached when the superabundance of that factor does direct harm. When tomatoes were grown under favourable conditions in four pots, to which successively increasing doses of sodium nitrate were added, there was an increase in growth from pots 1 to 2 but a decrease from pots 2 to 4, because in 3 and 4 moisture was deficient: water was thus the "limiting factor." Most soil problems are to be approached from the stand-point of the limiting factor and its counteraction. Thus dryness and acidity are counteracted by irrigation and organic manuring and by liming respectively. Thus Laboratory experiments often fail when applied to field practice, because in the latter case it is not possible to eliminate the whole of the limiting factors and make every other condition, except the one under investigation, as favourable as in the laboratory. The three main principles of crop production are accordingly: (1) the maintenance of an adequate supply of nutrients, chiefly nitrogen, potash, and phosphorus. (2) The biochemical decompositions in the soil must proceed smoothly and quickly. (3) The occurrence of limiting factors must be prevented by ensuring that all the requirements of the plant are satisfied. It is possible that the existence of plant accessories, or hormones, as agents directing and regulating the vital activities of the plant, may have to be included. The simple fact that phosphates increase plant growth is very complex in practice. Laboratory experiments on the effect of phosphates on plants in sand cultures are vitiated by the factor of the active phosphate inherent in the soil itself. Phosphates may be superabundant in a soil, yet the plant may starve for lack of added phosphate. Determinations of the "available" phosphate in soils by extracting with 1% citric acid led to results useful in practice but practically useless as a guide to the amount of available phosphate present. The reaction between a dilute acid and a phosphate in the soil is reversible, the direct solvent action

elongates and becomes enlarged at both ends. From the outer end arise the plumule and the roots, while the internal growth results in the formation of a large bulbous mass of spongy tissue pure white in colour. This is technically the cotyledon and is responsible for the absorption and digestion of the endosperm—the (the kernel and the liquid)—which is then passed on to the young plant. This beautiful arrangement is appropriately styled 'wet nurse' arrangement.

These enlarged cotyledons of the germinating cocoanut—in appearance much like a sponge-cake—are considered luxuries and food for the invalids by the Polynesians. Along the west coast of Mexico these enlarged cotyledons are dried and sold under the name 'cocoanut apples.' These are said to be very delicious. T. S. V. *The Journal of Heredity*. April, 1916.

The following table showing the proportion of ash and potash in various tropical plants has been extracted from the July number of the *Tropical Agriculturist*.

	Ash.	Potash.	Percentage on.
Castor seeds	3.2	0.5	dried sample.
Cocoanut husk (dry)	5.3	47.0	on ash.
" shell	1.3	26.5	"
Crotalaria juncea	4.0	14.1	"
Neem husk	13.6	0.75	on sample.
" Poonac	9.0	1.69	"
Sesbania Aculeata	6.2	15.6	on ash.
Tephrosia Purpurea	5.9	24.0	"
Tobacco	16.0	25.9	"
Tapioca (stem)	4.7	22.1	"
" (leaves)	8.6	14.6	"
Pithicobium saman	5.0	1.27	on sample.
Vigna catiang (dried)	14.2	3.46	"
" (fresh)	3.03	0.73	"

These figures are estimated on the sun dried sample.

From the above it is seen that cocoanut husk and shell contain in their ash a very large percentage of potash.

It is stated in the 6th November issue of the *Louisiana Planter* that large deposits of potash have been discovered in the State of Utah (America). So the dearth of potash need not be feared.

K. K. R.

Mr. H. O. Jacobson, Chief of the Plant Industry division Philippines gives the following results of a spacing experiment with paddy. Higher death rate of seedlings prevails in the close planting than in the widely spaced areas. Maturing period of the rice plant is not affected by the variation in spacing. An early maturing variety may be planted more closely than a late maturing one. Spacing has had little effect on the height of plants. Loss due to death of a certain percentage of seedlings which always operates against maximum production when only one seedling is used, is off set by planting more than one seedling in the hill. The limit to close spacing is reached in spacing 10 x 10 centimeters, and over crowding results. Consequently the greatest yields are found in the somewhat less densely planted areas. Under very intensive culture it appears that the proper spacing distance would have to be determined for each variety individually, also the approximate number of seedlings to be set in each hill. The tillering habits of varieties vary greatly and a distance satisfactory for a prolific variety would be altogether too great for one that stocked little. In conclusion, he says that one seedling per hill, provided with 100 square centimeters of area, evidently had all the room needed and was not able to fully utilise a greater area. Two seedlings on 100 square centimeters evidently competed for plant food to the detriment of each other but when given 150 square centimeters of area there was no evidence of damaging competition. The full extension of the tillering habit depends on environment, and if

the available food supply is abundant, the plants will quickly adopt themselves by means of additional culms. K. U. K. M.

Cultivation of Vadan Samba paddy in lands on the sea-board in the Tanjore District:—Soil. The lands on the sea-board are saline in nature, and they extend to very near the sea-shore and the fields near the sea are liable to be flooded with saltish water during certain periods of the year—chiefly in the months of October–November. The variety of paddy selected for being grown in such lands is Vadan Samba, and the plants would be sending forth their ears at the time the fields are flooded with saltish water.

*Method of cultivation:—*The nursery is prepared under the puddle system on receipt of water in the channels i.e., about the beginning of July and sprouted seeds are sown at the rate of 2 to 3 Madras Measures per cent of seed bed. The seedlings are pulled out when they are about 40 days old and planted about a span or a foot apart (the spacing, of course, depends upon the fertility or otherwise of the soil, planting being sparser in good lands than in poor ones), 4 to 6 seedlings being used in each hole. The lands would have been already got ready, and careful, or small ryots fold cattle or sheep in as large a portion of these lands as possible. As a rule, poor soils receive some manuring. It is considered safer to plant more seedlings together as the salinity of the soil may kill some of them. Saltish water gets into the fields during the flow of the sea in the mouths of October–November, and when it gets out of the field during the ebb, fresh water from the channels is let into the field and drained off with a view to remedy the bad effects of the salt water. It is said that, on certain occasions, it is not possible to do this operation, the crop then suffers much. Good rains at this stage are considered quite essential in such lands.

The after-cultivation done to the crop is the same as that done to paddy crops in general, viz., weeding. Under favourable conditions the crop is said to yield about 700 to 800 Madras Measures of paddy per acre. T. R. V.

*Window Box Vegetables:—*The women in Berlin have now taken to window and balcony gardening, and we are told of big competition now being carried on, to see who can grow the most on their little balconies and window sills. Flowers, however, have given place to the less ornamental but far more useful vegetable, and as every flat has a balcony, and every window a sill with or without sun, on that precious ground radishes, tomatoes, cauliflower, and carrots are being grown; and the waste comes in handy for the purpose of feeding the rabbits, of which, as a very prolific source of food supply, we are led to understand every German family keeps a large number. Other articles of diet are procurable only by ticket and every Berliner has a pocket full of cards nowadays: bread, milk, butter and potato cards, with in some cases rice and egg cards; and if to these are added the season pass on the tram the ticket for the barber, and the indispensable police card, each Berliner must carry about with him quite a respectable packet. Apparently the Hun has as strong a taste for cake as he has, or used to have, for sausage, but we are told that the sweet cake of which the Berliner is so fond is a wonderful production today. First it was ordained that no flour was to be used, unless mixed with potato, maize or rice flour, and then only in limited quantities. Then it was decreed that no milk should be used, and no cream. Fat and butter could only be had in the most limited quantities, but still the street cake appeared. Finally the use of wheat was forbidden but the bakers worked away with maize and rice meal with fruit and almonds, and although the choice was limited, the cakes were still there. (From I. D. News). W. R.

Wholemeal V. white bread:—There is no greater waste and no more unfortunate practice than the total exclusion of the bran or fiber of the wheat grain from our national loaf. The mineral salts in our foods have been placed in the husk or the skin for a wise purpose, and we are careful to exclude them as far as we can in almost all that we eat. They are responsible for the production of the bones and the teeth and they are vital to the blood, which, when reduced to a condition of poverty, affects the happiness, health and life of the man. A child fed on milk from which the minerals had been removed could not live, for it would obtain no bone making material, while its blood would be unable to nourish it. White bread consists almost wholly of starch and gluten, and when consumed, leaves no residue in the digestive system, for practically all is absorbed. It is this fact which accounts for the pernicious habit of the Englishman as a consumer of purgative medicines, to which the consumer of wholemeal bread is almost an absolute stranger. (Professor Long, in Pearson's Magazine). W. R.

Departmental Notes.

M. R. Ry., U. Mudlagiri Nayak s. a., is appointed Sub-Pro Tem 4th grade Assistant in Agricultural Chemistry on a salary of Rs. 75, 75, 75-5-125 in the vacancy caused by the deputation of M. R. Ry., T. S. Venkatraman, 3rd grade Assistant in the Sugarcane station.

He should report himself for duty to the Government Agricultural Chemist, Agricultural College, Coimbatore, at an early date.

C. R. Srinivasan, L. Ag., is appointed as Assistant Agricultural Demonstrator on Rs. 35-2½-75 on probation and posted to Koilpatti.

M. P. Kunhikutty is appointed Assistant Manager of Agricultural Stations on Rs. 35-2½-75 on probation, and is posted to the Central Farm, Coimbatore, for cattle work; vice K. R. Harihara Ayyar reverted to the Civil Veterinary Department.

M. L. Ry., S. Sundararaman, M. A., Assistant in Mycology, is granted 6 days' extension of privilege leave, in continuation of the one month's leave already granted to him from 26th April 1916.

The following appointments and postings of Assistant Managers of Agricultural Stations are ordered.

They will all start in the Lower Division on the grade of Rs. 35-2½-75.

1. K. S. Sankaran Pillai to be Assistant Manager of Agricultural Stations on probation with effect from 1st June 1916 the date of his joining the Department and to proceed from the Central Farm to Koilpatti Agricultural Station on the return of Assistant Manager M. R. Ry., V. S. Narayanaswami Ayyar from leave.

2. A. Gopalan Nayar L. Ag., to be Assistant Manager of Agricultural Stations on probation Taliparamba Agricultural Station.

3. L. Narasimhaachari L. Ag., to be Assistant Manager of Agricultural Stations on probation, Palur Agricultural Station.

4. A. Gopalakrishnayya L. Ag., to be Assistant Manager of Agricultural Stations on probation, Samalkota Agricultural Station.

5. G. Sitarama Sastri to be Assistant Manager of Agricultural stations on probation, Sirvel Agricultural Station.

6. K. Govinda Nambiar to be Sub-Pro Tem Assistant Manager of Agricultural Stations, Taliparamba Agricultural Station.—vice M. R. Ry., C. V. Seethachari S. P. T. in the upper Division.

7. A. Venkoba Achar to be Sub-Pro Tem Assistant Manager of Agricultural Stations, Hagari Agricultural Station vice M. R. Ry., M. K. Nambiar S. P. T. in the upper Division.

8. S. Viravarada Raju to act as Assistant Manager of Agricultural Stations, Mangannallur Agricultural Station.

Assistant Manager Bhairy Siva Rao is transferred on relief by No. 7, to be Assistant Agricultural Demonstrator, Godavari District for groundnut propaganda work.

Assistant Agricultural Demonstrator N. Raman attached to the Virudupatti circle is granted one month's privilege leave from the date of availing himself of it.

K. P. Sundara Ayyar L. Ag. Assistant Agricultural Demonstrator, Kadambur Circle, is granted 3 months' privilege leave from date of relief.

v)

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THE JOURNAL

OF

The Madras Agricultural Students' Union.

Vol. IV.

July 1916.

No. 7.

*N. B.-Contributors are requested to send in their contributions
written legibly in ink on one side of the paper only.—Editor.*

Editorial Notes.

We wish to draw the attention of our readers to a
recent appeal made on behalf of the Hospital Ship
"Madras." We are all aware that the initiative in start-
ing the Hospital Ship is entirely due to his
Excellency the Governor who has all along
taken keen interest in the cause. To main-
tain the ship efficiently, it requires 1½ lakhs of rupees per
month which is indeed a large sum and unless it is supple-
mented very largely by further subscriptions and donations
it is not possible to continue the useful work that the
Hospital Ship is doing. The cause ought to commend
itself to every true patriot of the country and we venture
to point out that after all, the ship is solely intended to
alleviate the sufferings of those whether Indian or British

who are defending the Empire and anything that contributes to mitigate the suffering and pain of the wounded ought to be most welcome. We commend the cause to our readers who, we hope will consider it a privilege to take part though it may be in a small way in this philanthropic undertaking. The Military Secretary to His Excellency will be glad to receive subscriptions and donations.

We congratulate Mr. Chadwick, the Director of Agriculture on having been selected as a special officer to enquire into the possibilities of establishing direct trade relations between India and the allied countries. We learn that Russia used to purchase several thousand tons of *copra* from Hamburg annually, which is mainly a South Indian product. We trust that by Mr. Chadwick's visit to Europe, not only direct relations will be established between India and Russia, but that the South Indian industries will much more largely find a place in European markets in future years, so that the export trade will greatly increase. Before the journal reaches our readers, Mr. Chadwick would have left our shores, and we wish though rather late Mrs. Chadwick and him 'bon voyage' and a safe return to our midst at the successful completion of his mission. At the same time we beg to extend a hearty welcome to our acting Director, Mr. G. A. D. Stuart, who has already acted as our Director on more occasions than one and in whom the Union is bound to recognise the sympathy and consideration which he always evinced.

The Forest College has been very fortunate to have had His Excellency the Governor at the College twice during the last nine months. Only in October last His Excellency opened the new buildings, and he was good enough to be present again on the 29th ultimo to give away the medals and certificates to the successful students of the College. We congratulate the Principal and the staff on this good fortune and the students on their well earned laurels. His Excellency gave them sound advice with regard to their dealings with the villagers with whom they will in their career constantly come in contact. His Excellency is aware of their ignorance and yet recognises their needs and while commending them to his audience he advised them to strive to dispel the one and supply the other.

We have much pleasure in introducing to our readers, "The Milk problem of Indian cities"—a recent publication by Dr. L. L. Joshi B. Sc., M. D., analyst to the Bombay corporation. In a country like India where consumption of milk is very large and yet upon which very little care is bestowed with regard to prevention from contamination, a comprehensive treatise such as this, dealing with social, economic, sanitary and legal aspects of the milk problem in India is most useful and welcome. We do not believe that the author claims for the publication much originality, but it is brimful of information dealing as it does though in a cursory manner with various breeds of cattle with their milking capacities, 'the analyses of cows' and

The Madras
Forest
College.

The Milk
problem in
Indian
cities.

buffaloes' milk in large cities of India, the extent of adulteration, the numerous diseases and disorders resulting from the insanitary conditions &c. We are of opinion that it would have been better for the author to have confined himself to the milk problem alone than to have launched on intricate subjects such as the various breeds of cattle, their breeding, and feeding &c. The chapter dealing with bacteriological examination of milk and the various experiments conducted is interesting and instructive. With regard to legislation Dr. Joshi believes that the economic, sanitary and other remedial measures for the production and supply of clean and wholesome milk should precede legislation, as he is of opinion that legislation alone without adequate provision for the economic production of clean milk is not likely to do much good. At the end of the book there is a large collection of photographic plates of various breeds of Indian cattle. The printing and the get-up of the book are good.

Mr. Chadwick's Greetings.

(The following letter was received too late for the Conference).

P. & O. S. N. Co., S. S. ARABIA,

Suez, dated 5th July 16.

DEAR SIR,

I write to wish all members of the Madras Agricultural Students' Union a very joyful and successful reunion on Old Boys' Day at Coimbatore, and trust that this letter may reach you in time. If it does please give to all members who are then assembled there my best wishes.

We have had a very hot muggy time coming round Aden and in the lower part of the Red Sea; but now as we approach Suez it is fresher. We ought to be there about midnight.

I trust that the Union will go on increasing in numbers, stability and vitality, and will for long continue to be a strong bond amongst all those connected with the scientific agricultural work of Saidapet and Coimbatore.

I hope you have a most successful meeting.

Yours Sincerely,

(Sd.) D. T. CHADWICK.

Poultry—What to Breed and how to Manage them.

[LECTURE BY MR. A. C. BULLMORE AT THE MADRAS EXHIBITION
JANUARY 1916.]

Your Excellencies, Mr. Chairman, Ladies and Gentlemen.—The subject selected for this evening's lecture, as you know, is about "Poultry—what to breed and how to manage them. In dealing with it I must apologise for the hasty manner in which I was compelled to prepare a subject of such intense interest and importance as this for your consideration this evening. My time has been so fully occupied in preparing separate exhibits for the present Show, that for the past ten days I have hardly had any time to devote to this subject. I must therefore ask you to kindly overlook any shortcomings in my treatment of it.

In this lecture it will be my aim to present, in as brief a manner as possible, the main features of successful poultry raising. The notice may be enthusiastic, but his enthusiasm may lead him to underestimate the value of careful selection and management. The majority are under the impression that rearing of poultry requires no special knowledge or experience. Many are therefore led into the

business not only with erroneous ideas, but have exaggerated views of the profits to be derived from it.

Many people, especially those living in the country, still keep on in the old ruts, breeding and managing without system. If successful and profitable poultry are wanted, they must have the same attention and proper management as any other stock. Those who think that there is nothing more to be done than to put a few fowls in a shed, and to throw a little corn at them two or three times a day in order to secure an abundant harvest of eggs, are sadly mistaken. Fowls can only be kept profitably by systematic management, and anyone who has not time or is not prepared to go to the trouble of keeping them properly should not keep them at all. Poultry keeping, taken generally is a subject which bears a double aspect, and is to be regarded from two points of view. From one point, it is to be viewed as a hobby, taken up and handled for the pleasure that is to be derived from it. From the other, it is to be considered as an employment, followed sedulously as a means of livelihood and pursued for the profit and emolument it will yield.

First, let us look at it as a hobby, as a means wherefrom to gather enjoyment, and a mode for whiling away many a passing quarter of an hour, which might otherwise be wasted and thrown away. It gives those who follow it something to think about at early morning, at mid-day, perhaps, and in the evening when the daily work is done, and the employment from which the means of living are obtained is put aside for the time, to be taken up again on the following day with increased zest and pleasure, by reason of the change of thought and change of work to which recourse has been had in the interim, a change that has led to the recreation and recuperation of body and mind and has taken the thoughts into other channels by which they are refreshed and restored from the daily cares inseparable from bread-winning and the daily struggle for life.

In all probability the fowls are kept in confinement in a small run devoted to their safe keeping, and a means of preventing them from doing any mischief to the owner's garden, if he has one, or to the

gardens of his immediate neighbours. Well, in this case there will be often something in the run and the poultry shed itself that demands attention, a little bit of mending, involving manual labour here and there, renewal possibly in one part and improvement or enlargement perhaps in another. There is pleasure to be gained from the pleasure in thinking out what is to be done, and pleasure in doing it after it has been thought out.

The selection of the best breeds depends upon the tastes and opinions of people. Some may choose to rear many breeds together, others again prefer a pure black coloured breed, whereas some prefer a spangled or spotted breed, and some a pure white. Then there are the different objects of keeping fowls. Some keep them solely for the table, some only for pleasure and merely to look at, whereas others again the majority, keep poultry to make a big business in breeding and selling, which is the most profitable and pleasing, I fancy. The best fowl to keep and breed I should say is the fowl of the day. All poultry are layers, but there are some breeds which have won a name for themselves in every way and mostly in their laying qualities. Laying is a matter of strain rather than breed; for in every breed there are good, bad and indifferent layers; but there is little doubt that there are certain breeds from which there is a better average result than others.

I am often asked which I consider the best general-purpose fowl. Well, I should think, taking all in all, as regards colour, size, shape, laying qualities, and a good hardy breed, the Orpington class will more fully meet the demands of the person who wants to keep one variety, such as the Buff or White Orpingtons. Indeed there are other breeds, but the above-named varieties are a long neck ahead of the English Class. The White and Buff Orpingtons are hard to beat for an all-round general purpose fowl, especially when they have been bred in line for laying. Several things are to be considered in choosing a breed of fowls. First, what is your object in keeping fowls? Do you want to keep them for eggs and table, or do you look upon the fancy part of the business? Have you one acre of ground, or, is it ten acres? Possibly it is only the back part of your house.

There are breeds of fowls to suit all these conditions if you will only give a little study to the situation. A person must have an object in view and work all the time to that end to make much of the success of the chicken business as well as anything else. If you have plenty of room—say five or ten acres—and want to keep chickens just for fresh eggs for the table, I would say select one of the smaller breeds of the Mediterranean type; for instance, the Leghorns or Minorcas; for with plenty of range they have been proved to be splendid layers and great foragers, but they must have room to do much good. I think any good breed of standard fowls will suit for the fancy business, if you can provide the conditions that suit the fowls, but right here is where you must do a little thinking.

Don't make the mistake of trying to raise small breeds in close confinement or the big Asiatic breeds with too much free range. If you are considering the fancy poultry business, just make up your mind as to the kind of fowls you most admire, and the one with which you think you will be successful. Stay with your best choice. If your space of ground is limited, I think it would be wise to take up the breeding of Wyandottes, Orpingtons, or Rhode Island Reds, for these large fowls stand confinement well, and if given the right kind of treatment and good wholesome food they will lay plenty of eggs—in fact they will lay better than some of the smaller breeds under the same conditions. You will have better results and will not be liable to become discouraged. You will do better with about 60 or 70 chickens well attended to, than three or four hundred with the same attention.

The demand for extra choice stock was never so great as it is now and must of necessity be greater day by day. In the first place, there are now more fowls shown than ever before, the number of Poultry Shows is rapidly increasing, and the offerings by the Associations are being annually made more attractive to exhibitors. So it is that the quality of the stock shown is yearly being raised and the demand for good stock is now far greater than the supply.

The present high prices of eggs and poultry will undoubtedly have a tendency to bring many beginners into the poultry world. The

first question confronting a beginner will be: "What kind of poultry will be the most advantageous to keep?" To this, I will say, start right; do not be persuaded to buy mongrels, for the following reasons:—First, it does not cost any more to feed pure bred birds than mongrels, Second, there is nothing so pleasing to the eye as a flock of birds of one variety. Third, pure bred birds will lay as many eggs as mongrels under the same conditions. Fourth, eggs from pure bred birds will bring an equal price for market and a much higher price for hatching. Fifth, surplus cockerels and pullets of pure breeds find a ready market at a good price. For a stated sum from a dealer you will get quantity when buying mongrels and quality when buying pure bred stock. It will cost more to start with birds bred to standard requirements, but the results will show in the end that an increased expenditure for pure bred birds in the beginning is the more economical course. As an illustration, let us take one of the most practical crosses of to-day, that is, the Leghorn male with light Brahma female. It is a well established fact that a Leghorn hen is the egg machine today, and that the Brahma is a bird which looks well on the Christmas table. Knowing the predominant characteristics of these two birds, we will say as a figure that the Leghorn hen lays 260 eggs in a year, and the Brahma, being meaty, lays, about 150 eggs per year. The results obtained by crossing the two is that we weaken the laying qualities of the Leghorn, as the pullet from this cross will lay on an average 175 per year and some of the good table qualities of the Brahma are also lost. Eventually nothing is gained, whatever gain there may be in one is lost in the other by this cross breeding.

If you have never paid particular attention to poultry but are starting to be interested in the subject, I believe this little talk will do you good. I was a beginner once myself, and know just where all the pitfalls and stumbling blocks in the business are to be found. I know how to get out of them without being bruised and blackened until discouragement looms up higher than a mountain. The trouble with a good many beginners is that they expect too much. I remember when I was exactly in that position I thought all I had to do was to get a few chickens, and take my

case until the rupees began to roll in. You and I will never see the time when poultry and eggs will not be in demand at profitable prices.

This is my advice:—To the beginners I would say, don't expect to get rich the first year; it is better to begin with a small flock or a few settings of eggs from a reliable breeder, and be content with small profits at first. You will be learning all the time how to handle and deal with larger flocks. You will grow into the business and in a very few years be ready to give your whole time to it.

The selection of the male birds is important, as they must be full of vigour. It is always advisable for those who are contemplating the purchase of new stock birds—no matter whether for laying purposes only or for breeding utility birds, or better class birds for exhibition, or those which are required for exhibition at once—to take care to obtain birds which are really suited to meet their requirements, as much disappointment is saved by the exercise of care in this direction. Unfortunately there are many who purchase a small pen of birds on account of their looking nice and being of a moderate price, and they find that they have bought fowls which are costing them money all the time and giving them very little return for it. In the various breeds of poultry we must remember all are not alike. There are some delicate breeds which are pretty to look at and need great care. They cannot stand too much confinement, and it would not be well for people in India to keep them. Probably they could not thrive and are unproductive. They are not worth while keeping except as pets.

The breeds mentioned are all profitable to keep, and it stands to reason which the fancier chooses; and whichever he does care must always be taken in the mating breeding, feeding, housing, etc., in order to get a good egg production. But out of all these,

if the object of the fancier is to obtain a real large supply of eggs and good birds, to gain a large profit in sale, with the least trouble, the very best breeds to keep would be the Orpington, Wyandottes, or Leghorn. A general purpose fowl and best for table is the White Orpington, its flesh being pure white, juicy and tender.

I shall briefly touch upon just a few useful breeds of fowls. Now we will take the Leghorn family. There are all told six varieties, but I only here mention about four, which prove to be the best and most popular. The six varieties are the Black, White, Buff, Brown, Pile, and Duckwing. The two last I leave out of mention. Leghorns are a very popular breed and have a very good laying quality. The head points of all the varieties in Leghorns are alike. The comb of the cock is single, evenly serrated and erect, while the hen's falls to one side. Their faces, combs, and wattles should be bright red, with white ear lobes. The body should be small and compact, with short legs and high standing tail, with yellow legs and beak except that of the brown Leghorn which should have a brown coloured beak.

Plymouth Rock:—These are a useful and a good general purpose fowl. The hens are very good layers of brown shelled eggs of a good size. Both male and female are hardy, and stand confinement well, if fed properly, although bred to better advantage if kept on a large run. The chickens are easy to rear and fatten easily. There are four recognised varieties, viz., the black, white, barred and buff. All the varieties are yellow-skinned with yellow beaks and legs, and the Black, White and Buff are self-coloured. The only variety needing mention in plumage is the barred Plymouth Rock, which should be grey white, formed evenly round the body with bars or bands of bluish black.

The Wyandottes:—These are a very good breed of fowls, being good table birds, hardy and excellent layers. They re-

semble the Plymouth Rock somewhat in shape and are very popular. There are four principal varieties mainly, viz., the white, buff, silver-laced, and gold-laced; but the white seem the best and most popular. The plumage of the white and buff is self-coloured with bright featherless yellow legs, rather short. The plumage of the silver-laced male should be quite silvery, each feather in the lower half of the wing coverts white with black edging; the hackles silvery white with a distinct black stripe through each feather.

Orpingtons:—The sub-varieties of the breed are black, buff, jubilee-spangled, cuckoo, blue and white.

The Black Orpington was the first variety introduced by the late Mr. William Cook. It is an all-round, good fowl, a decent layer of brown eggs, and a good table fowl, its flesh being tender and white. The Orpington is in all the varieties a pretty shaped bird, having a full broad prominent breast, short-curved back with a full feathered body, standing on thick short legs. The plumage of the Black Orpington is deep black, with green, sheen free from any other colour.

Of all the Orpington varieties, the White Orpington is the best in every way. It is a very popular fowl, and is becoming more and more so daily, the reason for which is its undoubted utility qualities. It is quite easy to rear, and hardy, and no layer of brown eggs can equal it in its laying qualities. In plumage it is the prettiest. The White Orpington, the standard of perfection, is snowy white, free from a speck of any other colour; its shape is that of the Black Orpington, being broad breasted, rounded and full; short curved—with a bold upright carriage; face, comb, wattles and ear lobes bright red, pretty red eyes, with short stout, white legs perfectly free from feathers.

I realise that it is too delicate a subject to speak upon the good point, of any one breed over others, as every fancier has his

own favourite breed, which generally meets all his requirements. As I have had practical experience with over 20 different popular breeds during the past few years I ought to be in a position to say why I decided on my favourite breed of fowls; and after once coming to this decision, I have kept on improving my stock until my fowls are known all over India. That the White Orpington is the most popular fowl of England to-day, no well-posted poultry man will deny. Its reputation is fast spreading over all parts of the world. There has never been a breed of fowls on record that has originated on the same sound principle as the Orpingtons, for they are what is known as an out-bred breed and as a result of many years' practical out-breeding, where the poultry raiser's main object is to produce the most eggs and best market fowls at least expense and trouble.

The first and most important subject after the poultry fancier has selected his breed and wishes to gain success, is the selection of the poultry houses. They are not very expensive to construct and the regard which all fanciers have for their poultry should carry them to the great interest of seeing to all the requirements and comforts of the birds, which is bound to lead to a profitable and pleasing business.

All poultry houses should be erected under proper supervision, the first to be made is the choice of the ground, and aspect of the house, which should be in an easterly direction. Good hard dry ground is required, which should be raised about 6 or 7 feet above the level of the surrounding ground, and rammed down well, and loose gravel thrown over this. Artificial flooring such as bricks, boards, tiles, or any kind of stone is not advisable. Brick are the worst for the floors, as they retain great moisture; boarded floors are not good as they get saturated with all the excreta of the birds, and cause the atmosphere in the poultry house to be very unhealthy. Tiles are similar to bricks and mean damp flooring. Cement is another floor which people think of but it makes a very

old one, unless covered with some dry material. So the best flooring for poultry houses would be good hard dry ground, covered over with a carpet of dry earth; sand is also very nice to spread over, but great care must be taken that the floor is swept out every morning, and fresh sand spread again.

The next step to be considered is the walls of the poultry houses, these can be built either of brick or wood. Some people build with mud walls. I do not advise this, because of rats and snakes, which might easily get in by boring holes in very quick time. If the walls are built of wood, great care must be taken that each plank is closely joined to the other to prevent big crevices. All the crevices should be filled carefully to prevent draughts, or any vermin resting inside, then the whole of the walls inside properly tarred.

The third step regarding the house is roofing, which is a very important matter. The roof of the poultry house should be made quite sound and attached on well, to stand rough weather and strong winds.

The size of the poultry house should not be extra large. It is a great mistake for people to think they can house all their poultry together in one large room. Too many fowls cannot be placed together in one large room, as it causes unhealthiness to them, and if an epidemic were to break out, such as roup, cholera, pox, etc., there would be very little chance of saving any part of the flock. Separate houses for poultry in small lots are the best, and even more so for those who keep a very large stock. Attached to each house on one side there should be the scratching shed.

Some people imagine that birds do not require much light and air in their houses. This is a very silly impression to be under indeed, and I must mention that birds are as fond of light and fresh air as human beings, and they also need them as much. We

cannot expect the fowls to thrive in dark and entirely closed houses. All poultry houses should have a window which can be closed or opened according to the weather, and as the poultry fancier desire it. The width of the perches should be about 2 to 3 inches, the edges should be nicely rounded to allow the birds a good hold. They should be of the length of the room and far enough from the wall to prevent the cocks' tails being destroyed.

The next requirement in a fowl house is the nests. These can be placed near one side of the wall, made from dealwood in the shape of a box, a square large enough for the hen to sit. It should be 6" deep to hold the straw which completes the nest. Nests can also be made from earthenware, such as a large flat-bottomed chatty, 5 or 6" deep, and can be filled with fine sand or ashes for the laying hens.

Another matter which should always be considered for fowls in each shed is the dust bath for the birds to roll and bathe themselves in, which helps to cleanse them from any vermin. This should be of very fine dry sand or sifted ashes, or even clean road dust placed in a good heap, which should be renewed daily; and the previous dust bath which has been removed ought to be thrown a good distance away from the fowl yard, in case it should be infested with any vermin. The fowls will be found in their greatest delight bathing and cleaning themselves in the dust bath every day.

The feeding of poultry is a matter that should be well-attended to, and nothing but the best of all kinds should be given. Stale goods or old rotten grains are very bad for fowls. One of the chief and most natural foods is grain, though they cannot entirely live upon it; for the fowls also need a fair amount of soft and green foods, but grain ought always to be supplied them at the proper time. There are various kinds of grains and some are more nutritious than others. Many fanciers think that

mixtures of grains are more suitable than supplying each kind separately, but this is not so in every case. It must all depend as to how the poultry keeper finds his birds thriving. Of all grains, wheat is considered the best, either given whole or coarsely ground. Then there are oats, barley, peas, beans, Indian corn, gram, and maize. Oats, form a very good food, and nothing equals it for adding size and stamina to young stock. Barley is good when given as barley meal mixed in other food or with skimmed milk or water, but fowls in India will not so readily eat it as a whole grain. Peas and grain are the richest in albuminoids, and are very good for the laying hen. Indian corn is very fattening for fowls, but should not be given very often to poultry kept for breeding purposes.

Another important matter we come to concerning the fowls' food is the green food. Without this it is impossible to keep fowls in perfect health. A daily supply of green food is grass: hence the reason it is so necessary to have grass runs for the birds.

The importance of grit, oyster shell, and charcoal ought never to be forgotten, for in addition to the daily food it is necessary that the fowls be supplied with these. Grit is very important, and you will always find the fowls readily eat it as well as oyster shell and charcoal. We must always remember the fowls have no teeth, and if not supplied with sharp grit they won't be able to digest their food. Grit acts as teeth to fowls, and should not be mixed with the food, but a quantity of it should be placed in the run in a grit box, so that the birds may eat at will.

The morning meal should consist of soft food, given as early as possible. Many people fancy that grain should be the bird's first meal, but this is not correct, as the birds are empty stomachs, having fasted the whole night; and grain given to them the first thing in the morning takes a long time to digest, and has to be ground in the gizzard first.

The evening meal should be of whole grain thrown to the birds; allow them to run after it, and pick it at their will, just an hour or so before sunset. The grain is a good thing for the evening meal, as it takes long to digest, not causing the birds to be empty-cropped by morning. All refuse such as scraps of meat, bread crumbs, vegetable, curry and rice from the table can be given to the fowls.

I shall now give you a bunch of good tips for poultry keepers. Provide gravel, it means teeth. Provide ventilation, it is health. Provide sulphur, it prevents disease. Provide lime and bone, they supply a want. Select the best-shaped and largest eggs from the best layers for hatching. The best absorbers to strew on the floors and under the roosts are sand and road dust. One of the best tonics for chickens, and probably one of the simplest, is to keep a handful of old rusty nails in each dish from which they drink. The rust is the oxide of iron sold by druggists, and the tonic made is as good as the sale article.

I have, within a limited period, given you the bare outlines of how to select a good strain of poultry and how to manage them. There are various other points connected with poultry keeping, such as mating and breeding, eggs for hatching, care and rearing of chickens and diseases of poultry and their treatment. I am afraid if I touch upon all these, however briefly, it may be take up too much of your time. I shall therefore close with one request, if you are anxious to become a successful poultry breeder for pleasure or profit, and are doubtful as to the best means of doing it, please come to me, and I shall endeavour my utmost to put you on the right track. In conclusion, I beg to thank you, Your Excellencies, Mr. Chairman, Ladies and Gentlemen, for your kind interest in listening to what to me is an absorbing subject.

Tirupur Cattle Show.

I was proceeding to the Show grounds this morning, when I was accosted by a young man in a green coat. I saw several of them all along the main road posted like policemen on duty. On my approaching him, the young man pointed to me a ryot's field close by saying that the working of the improved ploughs was being demonstrated there and that I might be benefited by having a look at the working. I turned my way to the spot when one of my ryot friends joined me. Several ryots thus diverted by these young men also followed. There were already in the field a good many ryots and the number increased enormously in a short time. Some European gentlemen, were also seen here. One of them assisted by Indian Officers, was directing the demonstration and two iron ploughs were working. I questioned my friend what he thought of the iron ploughs. "This would never suit us" was his reply. He said, "Big pairs costing Rs. 300 to 400 will be required for working the plough and he cannot afford the money."

Q. What have you to say regarding its efficiency?

Ryot:—Oh! With my country plough, I can work without any difficulty. The iron plough is very heavy. Two men will be required to carry it. You see they are working it with big pairs. The animals will also require a lot of training. Some firm wants to find a sale for these ploughs. Look at the big Dorais.

While we were thus talking together one of the persons assisting the Dorai overheard us. He asked what our difficulties were. I told him the objections raised by my friend. The officer immediately procured a pair of tiny animals standing close by, yoked them to the iron plough and asked one of his men to work the plough. With some difficulty in the beginning, the animal began to plough all right.

Q. What have you to say, now? the officer asked.

A. The men must be trained to work this plough.

My friend was immediately asked to handle the plough himself which he did with ease; but after every turning he hesitated to follow the officers' instructions which he was induced to do.

The Dorai was also inducing every ryot he can get hold of to handle the plough and to get an idea of its working. We were explained that while the country plough left a space of unploughed land between every two furrows, the iron plough did not, as it turned the slice of earth to one side. The ryots were asked to examine the ploughed portion for any unploughed land. One of the ryots then said that the plough will suit him if the position of the mould board could be changed from left to its right. Every ryot began to repeat this like a chorus. On questioning the ryots, I understood that the work of the mould board puzzled them and that they raised all such objections not trying to know about the correct use and work of the mould board.

I also gathered that these young men so kindly showed us to this ploughing demonstration are the students of the agricultural college and that the demonstration was got up by the Principal, Agricultural College, Coimbatore solely for the benefit of the ryots.

In the afternoon, accompanied by my friend, I proceeded to see the cattle, exhibits etc. After going round and seeing most of the cattle, I asked my friend.

Q. Do you intend buying any cattle.

A. I purchased 3 years back a few pairs and for one of them I paid Rs. 120/- After working this pair of animals for nearly 2½ years. I disposed them of last February for very nearly the same amount.

Q. How did you manage it?

A. The price of animals is going high. I am sorry for having disposed of my animals so cheap.

We met here again the young men in green coats. They were examining closely a pair of working animals.

Q. "Well! Do you intend buying these animals?" was my question.

A. Yes:—one of them replied—

I want to examine the marks on the animals before I make up my mind. Do you know much about the marks on cattle?

I introduced to them my friend who knows most about the marks. He explained to them all the twelve different marks, took and showed them in different animals. He added which marks are considered good and which bad.

We then found our way into the exhibition grounds with great difficulty as the cattle stands and roads were thronged with visitors for the show. We saw laced cloths, big plantain bunches, big mangoes, and several iron ploughs similar to the one found working in the morning. The man in charge, explained that spares for the wearing parts are available.

			Rs.	A.	P.
Spare point	...	...	0	6	0
Spare share	...	...	0	12	0
The cost of the iron portion of the plough			15	11	0
and of the wooden portion	...	...	1	8	0

We heard some of the lectures delivered in the evening. On our way home, I questioned my friend what he gathered from the lectures and how far he would carry the instructions given.

As regards treating cholam against smut, my friend told me he was not prepared to soak the seed in copper sulphate water and people will die if they eat that seed.

Q. How are you going to improve your Cambodia? I asked.

A. Aiyar wants to pull out all uppam and Ladan plants from Cambodia fields. How can we do that? My field will then be vacant and I will get very low yield. Aiyar said one thing. It seems to me to be good.

Q. What was that?

A. To separate the uppam seed from Cambodia before sowing by means of a sieve. All the uppam seed will drop being small.

Q. Then there will be very few uppam seeds left in the Cambodia at the time of sowing. Is it not?

A. Yes.

Q. Then you can pull out from the Cambodia field the few uppam plants to keep Cambodia pure.

A. Yes: I can do that.

Q. Did you hear the Aiyar say to pick in the field, good kappas for one's own seed.

A. It seems sound. We do it as regards ragi. We can do the same here too.

Q. Can you do this in your next season crop?

A. I shall try. You know there is a long way between saying and doing.

Q. What have you to say as regards implements shewn for sowing and for interculturing.

A. We must see them at work. Can you take me to the Coimbatore Farm some day?

I agreed to his request and I told him that we must wait till the sowing season when we can see the actual sowing and later the interculturing with the bullock power.

16-6-1916.

A VISITOR.

Notes.

Babul Pods as a Tanning Agent:—The above is the heading of a contribution to the May issue of the Indian Industries and Power (Bombay and Calcutta) by Mr. J. P. Srivastava, M. Sc., A. M. S. T.,

and the following is extracted. An enquiry and a series of laboratory trials seem to have been undertaken at the suggestion of the Director of Industries, United Provinces, to test the suitability of the pods for tanning purposes on a commercial scale, the trials in the laboratory having so far proved very successful.

Well known tanneries of Cawnpore are large users of Babul bark. The pods contain from 18 to 20 per cent. of tannin while the bark seldom contains anything more than 16 per cent. Though the pods are richer in tannin they have not been able to use the pods because the tan liquor from the pods speedily undergoes deterioration and this seriously affects its property for tanning purposes. This deterioration in the tan liquor does not however affect its value for being successfully used as a mordant for dyeing basic colours on cotton. But in the process of tanning the liquor must stand for a certain number of days during which period it must not go bad.

The experiments conducted have therefore aimed at the prevention or delaying the fermentation of the tan liquor. Carbolic acid has been used for preventing the fermentation of the infusion and the following suggestions are therefore offered after a series of trials.

(1) (a) The use of 0.3 to 0.5% of the crude carbolic acid on the weight of pods used.

The above while not completely preventing the fermentation of the liquor—indeed a certain amount of fermentation goes on and is necessary for successful tanning—is however sufficient to retard fermentation.

(b) Phenazole acidified by acetic acid (0.25%) may also be used in place of carbolic acid.

(2) If the dilution of the tan liquid is increased the percentage of the antiseptics should also be increased proportionately.

(3) Temperature also plays an important part. Below 60 degree Fah. the tendency to ferment is much reduced. During winter therefore it should be possible to use the pods without any fermentation.

At present the pods do not find any use. When in season only a very small portion of it is used as food for goats and sheep. The pods are said to keep well when dry without undergoing any deterioration in quality. If the industry could therefore be worked as a commercial concern there is no doubt a large demand would at once spring up for the pods and would put some money into the pockets of the ryots for a stuff which at present is largely allowed to go to waste.

(C. N. A.)

Crabs Damaging Paddy Crops. A Remedy: Crabs are known to be a serious pest in paddy tracts of this Presidency, and this was brought to the notice of the Government Entomologist last year and his advice was sought. The matter is under investigation. The following extracted from the *Agricultural News* Barbadoes is worthy of a trial:

“Boil corn meal and stir in about a stick of phosphorus to 8 gallons of meal whilst it is very hot, in order to dissolve the Phosphorus. This mixture is then put out about a dessert spoonful in each hole and the hole plugged with earth or any such material.” It is also stated that Bread-fruit or Bannanas (Plantain) cut to pieces and mashed so as to form a pulpy mass may also be used with the Phosphorus as above. Great care is necessary in handling the Phosphorus as it is extremely inflammable and poisonous. (C. N. A.)

Cultivator's method of seed-testing in Behar: The cultivator's method is a simple affair. The media which he selects for sprouting seeds are the very watery cellular leaf-stalks of the elephant yam or plantain which provide the necessary moisture. These stalks are cut up into convenient lengths, partially split open and the seeds placed in contact with the moist fresh-cut surface. The split portion is then tied up to prevent seeds dropping off. These are then left in a clean cool but damp corner of a room preferably where pots containing drinking water for the household are kept. Usually 16 seeds are put to the test. The seed is considered good with 13 germinations and above, and medium if it does not go below 10. If below 10, it is considered

bad and rejected. Wheat, barley, oats, peas and lentil are usually tested before sowing. (Behar Agricultural Journal.) G. N. R.

Games.

The first *football match* of the term was played in the London Mission Ground between A. C. & R. I., and London Mission High School teams. There was a fairly good number of spectators to witness the game. The match was however evidently one-sided, the Agriculturists having shown their distinct superiority over their opponents on account of their fine combination. After a few minutes the first blood was drawn by Chellam of A. C. & R. I. Play still danced round the Mission goal and Samuel Nallathambi had his share by scoring one more with the help of Venkataraman who made a good pass. The Missions tried their utmost but all their efforts proved fruitless. Kuppuswami the Vice Captain—a new addition to the team kept the other forwards in check. The defence of the day was due to Ramana Rai and Muthuswami. The A. C. & R. I. won the match by two to one.

2. The First *hockey match* for the season was played in the A. C. & R. I. grounds with the Stanes. From the bulley off the home-stead broke away along the left and tested the opponents goal who however defended very well. For the rest of the time the play swayed up and down and both the goals had very many narrow escapes. Our team would have fared well if Mr. Parnell and Ramana Rai were present on that day. Stirred by the cheers of the students and officers witnessing the game the A. C. & R. I. assumed the aggressive during the second half. The Stanes were left winners of the day by 7 to 5.

3. A *hockey match* was played between the past and present students of the Agricultural College in connection with the College day of 1916. The game was fairly well contested and the

team of old students which included two of the European officers, Messrs Hilson and Anstead, put up a tough fight. 15 minutes after the start Dharmalingam pinned the ball to the net. Owing to the fine combination between the forwards of the present team 4 more goals were secured. The past students and officers tried their best to draw their level with the present but the full-back Abishekanathan proved a strong barrier to their progress and eventually the match ended in a win for the present students by 5 to nil.

4. A return *foot-ball match* was played on the A. C. & R. I. grounds between A. C. & R. I. and the London Mission teams. The College team did not do well as it was expected to owing to the absence of some of the good players. Dharmalingam might have exhibited a still better game had it not been for the hit on his leg. He was however able to pass skilfully with Chellam who took advantage of the same and managed to put in a goal. Soon after the opponents scored a goal by a fine corner kick and kept the game in a draw for some time. The central half-back Subrahmanyam made a quick start with the ball and scored a goal to his credit. The opponents made two more goals consecutively and left the A. C. & R. I. team losers of the day. Had it not been for Mr. R. C. wood who was at the goal the result would have been much worse.

Departmental Notes.

Assistant Agricultural Demonstrator M. Raman is on return from the one month's privilege leave granted to him, transferred from the Viruduppatti Circle to the charge of the Government Coconut stations in the West Coast with headquarters at Kasaragad.

K. T. Bhandary Assistant Manager of Agricultural stations, Taliparamba will take charge of the coconut stations till the return of Assistant Agricultural Demonstrator M. Raman from leave.

N. V. Visvanatha Ayyar L. Ag. Assistant Manager of Agricultural Stations is granted an extension of privilege leave for 15 days in continuation of the one month's privilege leave already granted to him.

M. R. Ry., K. Ramiah L. Ag. Assistant in Economic Botany is granted an extension of one week's privilege leave in continuation of the one month's privilege leave already granted to him.

M. R. Ry. V. S. Narayanaswami Ayyar, Assistant Manager of Agricultural Stations is granted an extension of privilege leave for 15 days in continuation of the one month's privilege leave already granted to him.

M. R. Ry., C. V. Seshachari L. Ag. Agricultural Demonstrator is granted an extension of privilege leave for 6 days and leave without allowances for 24 days in continuation thereof under Art 389 C. S. R.

We are glad to note that G. Duraisami Iyengar L. Ag. has been appointed as Agricultural Instructor in the Pudukota State.

THE JOURNAL

OF

The Madras Agricultural Students' Union.

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No. 8.

N. B.—Contributors are requested to send in their contributions written legibly in ink on one side of the paper only.—Editor.

Editorial Notes.

On the 4th of August as the College clock struck 1 P. M., the whole of the A. C. & R. I. estate—students and officers—gathered in the lower hall of the college to celebrate the Anniversary. The ceremony was simple but impressive. The Plough and the Powder are perhaps more opposed to each other than any other pair we can think of, and as such there is a deep significance underlying this celebration. It shows how thorough has been the mobilization of the forces of the Empire on behalf of Horror, Justice and Humanity. Nor has this institution been lagging behind in playing its little part in the great struggle.

Standing before a pillar decorated with the *Union Jack* the Principal made a befitting speech which is here reproduced:—

Staff and Students of the Agricultural College, We are met today on the occasion of the second anniversary of the

The second
Anniversary
of the War.

opening of the present great struggle. Such an occasion does not demand much from me. We are met here with mingled feelings, but of these the chief is perhaps the feelings of sorrow due to the appalling loss of life, and the misery and suffering attendant on a war of this nature. We cannot realize the magnitude of this struggle. We have had peace in India and in England so long, that we cannot realise a state of things when law as such does not exist, when a man's house ceases to become his own, when it can be entered against his will, when his honour and his life itself are unsafe. I recently sent to some of you a book dealing with the German atrocities, and I think any one who has read that will realise with thankfulness that his country is at peace, and will do his utmost not only to relieve the suffering which is bound to occur; but also to do his bit—however small a bit—to bring the war to a speedy close.

We have a special cause for grief in the loss of Lord Kitchener, to whose foresight we owe the splendid armies now upholding our cause. We in India, remember too that the re-organisation of the Indian Army which enabled it to be used at the very beginning of the war, was due to his genius and are thankful. But there are other feelings than those of sorrow. There is the feeling of *pride*; pride in the fact that we are all members of an Empire, the like of which the world has never seen. Pride in the fact that this awful world war into which the Empire has been plunged against her will, has shown the soundness of the Empire, and has knit closer the bonds which hold it together. Pride in the behaviour of our troops, whose gallantry in war, and tenderness towards the civil population are in such marked contrast to the behaviour of our enemies.

And the third feeling which I venture to think occupies our minds today, is that of *hope*. It is true that from the first we and our Allies have never despaired of the ultimate victory, though the outlook has at times been black. Still without being

unduly optimistic or unduly elated, we may I think, draw comfort from the events of the past few months. Our foes are still strong and terrible, and the hardest part of our task is yet before us. But there are signs that at last we have caught up Germany and Austria in the years of preparations which they had enjoyed before the war started, and are at last able to decide where and when we shall fight. We have in the past too often been forced to follow our opponents' lead and fight in positions and under conditions which they had selected, but now, thank God! that is over, and we can take the offensive, and look forward to the future with quiet confidence.

It is an inspiring thought that this small assembly, insignificant as it may be, is a link in an organisation which is absolutely world wide, that everywhere throughout this Empire, actuated by the same feelings as have actuated you to gather here, people are assembled to acknowledge their indebtedness to the British Empire and the Flag under which we live and to pray for it in its hour of need. I would ask those of you who will to accompany me outside, and, in the words Mr. Chadwick used on this occasion last year, to join in three cheers for the "*Flag that must prevail!*".

The party then adjourned to the front of the College and as "the Flag that is bound to prevail" was hoisted on high, three cheers were proposed by Dr. Barber and were lustily cheered.

The year's College Day and Conference was a great success, partly because of the larger number of officers deputed from the Districts. Our thanks are due to the Director and the circle officers for this and we hope that we will continue to receive this support. In these days of conferences one is liable to underestimate their value. We firmly believe that a conference like ours goes a great way towards infusing

College Day
and
Conference.

time immemorial. But the unfortunate thing is, that, beyond this mere idea we know hardly anything regarding the teeming millions of animal life that surrounds us. Excepting perhaps some of the higher animals, most of the rest of the animal world, especially lower forms of life hardly ever receive our serious attention. This ignorance of Nature and even indifference to know, must be attributed to nothing else than the peculiar way we have been trained up and the atmosphere in which we get our training. I have often heard it said, that those who love nature are apt to be long-lived and that their lives are likely to be happy ones. In spite of the fact, that we have a good many grey-haired old men among us, few people in this country appear to realise that idea. In the western countries we often find a love of nature fostered through early childhood and we come across men of various occupations who study plants and animals as a hobby or a pastime, or even sometimes, as a relief from the daily drudgery, of life. On the other hand we find very few people who have a leaning towards nature study in this country. It is not because we are unfit for this work but because of the peculiar attitude we present towards natural objects, especially lower animals. We have been somehow trained to look upon lower animals as unworthy of any attention, and with prejudice and aversion. Lower animals, especially minute forms like insects are regarded as a cursed lot specially created to torment and be a nuisance to higher animals. When this is the sort of attention paid to natural objects, we can easily imagine the cause of our ignorance regarding the various remarkable inter-relations existing between us and lower animals. However, due to various known and unknown causes the conditions are changing and a marked reaction is seen to take place. Educated men have begun to realise the fact that of all lower animals insects play an important part in the many departments of human interest. The recent discoveries by eminent men of science that small and apparently innocent creatures like the mosquito, the house-fly, and the bed-bug are capable of disseminating some of the deadly diseases among man, have more than anything else brought to the foreground the importance of the study of insects and their ways, and I hope in due course insects will receive better and far more serious attention at our hands than they have been till now.

It is not now my intention to-night to deal with the various aspects of insect activities but shall only devote the short time at my disposal to place before you a few disconnected thoughts on the influence of insects on Agriculture.

THE FARMER'S CLASSIFICATION OF INSECTS:—

Among the various living beings inhabiting this world of ours, no other group of animals, except perhaps the fishes, can approach the insect community either in numerical strength or in the wealth and variety of species. From the farmer's point of view all insects fall into three convenient groups. First those that cause injury to his crops and other property and bring about loss, secondly, those that are beneficial to him either helping him to fight injurious insects or giving him useful products and the third division including the rest of the insect world which so far as we know at present do not interfere with the Agriculturist either for good or evil: we might therefore confine our attention to the first two divisions.

A—INJURIOUS INSECTS:—Insects causing injury to the farmer in various ways may be called insect pests. An insect becomes a pest when it damages crops or other things and causes appreciable loss thereby. There is a general idea that insect pests, especially those affecting crops, appear more frequently nowadays than in past years. I have also come across many an old land-lord asserting with a pride of the past, that during his palmy days they had to contend very little with crop pests. We have to admit the truth of this statement to some extent. For, as civilisation advanced and man began to conquer and control nature in various ways, what is called the natural balance of life became often upset and animals and plants began to exhibit abnormal conditions. Ordinarily the lives of animals and plants are so wonderfully adjusted in nature that the extra-ordinary increase of one species to the detriment of another is held in check and practically impossible, and this condition is called the natural "Balance of Life." But under artificial environments produced by man, this even level of life is upset and we hear of insect out-breaks. The circumstances mainly responsible for these changed

conditions are, among others, the destruction of wild jungle for various purposes, the growing of single crops in extensive areas, the indiscriminate destruction of several insect enemies—such as birds, bats etc. etc., and the frequent transport of insects and plants from country to country. These causes, as they are taking place daily, must account to a great extent for the frequent occurrence of pests in these days.

CROP-PESTS:—Most important among insects affecting the farmer's properties are what are called crop-pests affecting growing crops in the field; and of the various crops grown the farmer regards his staple food and industrial crops as the most important. In Southern India staple food crops like Paddy, Cholan, Ragi, Cumbu, etc. have all to pay their toll to insect pests. It is not possible at present to detail all the pests affecting each of the important crops grown by our farmers. But I shall add a word or two only about a few of the important ones to give an idea of their work and the nature and extent of the loss brought about. Foremost among crop pests in India is the insect called the Paddy Stem Borer. This insect is found in all rice-growing tracts in India and may be regarded as the most important of all crop-pests in Southern India. The insect is a moth and the immature stage of the moth, called the caterpillar, bores through the growing paddy stem and kills the shoots. If the plant attacked is in ears, we get no grains but only chaff. It may be stated in this connection that insect pests of plants called borers—because of their habits of tunnelling through plant tissue of different kinds, stem, roots, shoot, fruit etc.—are the most serious of all. They feed hidden and in many cases we only find the plant damage as an external indication of the work done by them. Thus our most important pests are borers. Cholan and Sugarcane have their borers doing often considerable damage. Nor are other important crops like, cotton, tobacco, castor etc. free from attacks of borers. The cotton bollworms—insects boring into the bolls and top shoots of the cotton plant—cause a great deal of damage in cotton areas. A good many fruit trees also suffer from the attacks of borers. There are various other insects which though not so serious as

borers, do damage to crops in other ways such as by defoliating the plants, cutting, rolling, or twisting the leaves, nibbling the shoots, flowers or the bark, and feeding exposed in various ways. Of this group of insects which are commonly seen exposed the well known ones are Grasshoppers, Hairy Caterpillars, Ordinary caterpillars, Plant lice, Bugs and Beetles of sorts.

Just as man, insects too have their peculiar tastes. Each crop or set of allied plants has its characteristic insect guests and these latter generally confine themselves to only one or other of these plants. In this way we may sort out crop pests of Cereals, of Pulses, of Fibre crops, etc. etc. or pests of graminaceous, leguminous, cucurbitaceous or cruciferous plants.

It may be stated that very few cultivated crops are immune to the attacks of insect pests. While there are some plants which are subject to the attacks of only one or two specific pests there are others which have to feed more than one insect intruder. As examples of the latter may be mentioned paddy, cotton and red gram. Insect injury to plants begins from their very existence in the field up to the time of harvest and each stage of different plants has its peculiar insect enemies. While the plant is young the tender seedlings are cut, as it grows the stem, shoots and foliage suffer, while as it blossoms and puts forth fruits it is subject to the attack of blossom-eaters and fruit-borers. And it is interesting to note that the life of the plant and its insect guests are so very wonderfully adjusted that the fruit attacking insect comes into existence just when the plant puts out fruits and the leaf-eaters appear just when the plant is young. So much for crop pests.

PESTS OF STORED PRODUCTS:—The farmer, who thinks that he has nothing to do with insects as soon as his crops are off the field, is one who knows very little of the depredations of insects on other things belonging to cultivators.

Just as there are insects attacking growing crops in the fields there are others levying their toll on stored products such as grains

pulses, seeds etc., in granaries, warehouses, shops and godowns. We have often heard of weeviled rice and pulses. Of all these the most important is the rice weevil a minute dark creature having a prominent snout. Very recently there was a serious outbreak of a boring beetle attacking stored paddy in South Arcot and other places and causing substantial damage.

PESTS OF CATTLE:—Nor are the farmer's cattle free from insect attacks. Various kinds of flies, mosquitoes and fleas affect cattle and make them emaciated and unfit for agricultural work. Especially is this the case in rural tracts near jungles. In these places we find cattle often infected with hundreds of blood-sucking flies and looking a very miserable lot!

EXTENT OF DAMAGE:—I have thus given a few facts regarding the activities played by injurious insects on the farmer's crops, his stored products and his cattle. The unfortunate thing about our farmers is that they do not fully realise the steady and substantial loss caused them in this way. To the average farmer it is only the occasional flights of locusts and plagues of caterpillars that appear impressive and prominent but he is blind to the many other insects which silently but steadily levy a heavy toll on his crops and other things year after year. The ravages of the paddy stem borer, the cotton bollworm etc. may be brought under this category. In this country where scientific agriculture is of very recent growth we have hardly any statistics or data showing the extent of damage and loss caused by insects of different kinds. To give our farmer an idea of such a thing I will just invite his attention to the following remarks of an eminent American on the extent of loss sustained by insect damage in that country "The yearly losses from insect ravages to crops aggregate nearly twice as much as it costs to maintain our army and navy, more than twice the loss by fire, twice the capital invested in manufacturing agricultural implements, and nearly three times the estimated value of the products of all the orchards and vineyards in the United States!!" For India, we are rather too early in the field for such statistics; but I might, however, invite

your attention to a statement made in this connection by the late Mr. Noel Paton till lately the Director General of Commercial Intelligence. After making careful investigations on the rice industry of India and Burma he concludes that the annual loss to India due to the attack of weevil on rice exceeds 120 million rupees!. To those who have any doubts about this I recommend a perusal of Mr. Noel Paton's interesting pamphlet on "Burma rice" published by the Government Press Calcutta in 1912. There is no doubt therefore that a good percentage of the Indian agriculturist's crops goes to feed insects, when we only consider that one single insect like the rice weevil is capable of exacting such a heavy toll!

B—HELPFUL INSECTS:—From these grim facts showing the substantial damage done to the farmer by insect-pests we will now turn to the other side of the picture—a pleasanter but little recognised one, I mean that part played by certain insects for the good of the agriculturist. To convince our average ryot that there are good individuals among insects is rather difficult. Being very familiar only with the more obvious injuries done by insect pests he often concludes that there cannot be any good insects and the only good ones according to him are dead ones. It is therefore necessary that every farmer should know, that among insects there are several forms which are eminently beneficial to him and learn to recognise the good from the bad and not condemn all alike. "The first step towards vanquishing an enemy" says Curtis "is to ascertain correctly its habits, the next is to be certain of its appearance as not to mistake one party for another, and a third and no less important object is to be well acquainted with our friends and allies". Due to this want of discrimination between good and bad I have many a time received decidedly helpful insects sent in as doing serious damage to crops! The good influence exercised by certain insects on the farmer's belongings may be divided into.

i. HELP GIVEN BY INSECTS AS NATURAL ENEMIES OF PESTS.

ii. HELP GIVEN AS FERTILIZERS OF FLOWERS IN MANY CASES.

iii. GIVING PRODUCTS USEFUL TO MAN IN VARIOUS WAYS.

i. INSECTS AS NATURAL ENEMIES:—Under the first group we have what are called Predatory and Parasitic insects. The first includes those that catch other insects as prey and devour them. Of predacious insects there are many that feed on insects that are crop pests and in this way help the farmer to check them. Some of the prominent among predators are the praying mantis, dragon flies, beetles, bugs, wasps and flies of different kinds. Among these one group of small beautiful beetles which glory under the dignified name of "Lady birds" do a great deal of beneficial work. The young ones of these beetles play a very important part by checking plant lice, because they almost entirely feed on them. Most of you must have perhaps seen wasps carrying green caterpillars and storing their nests with these creatures as food for their young ones. Very often these caterpillars thus carried from fields happen to be important crops pests! The other class of insects which are called Parasites do their work of destroying pests in a somewhat different manner. Instead of all at once devouring the host, parasitic insects generally lay eggs on the bodies of other insects which they ultimately destroy. The young ones coming out of these eggs feed on the host by gradually eating up its tissues. In this manner one parasite is able to kill several insects by laying eggs in a number of them. Many insect parasites attack important crop pests and in this way greatly check the rapid multiplication of crop pests. "Out breaks of injurious insects says Dr. Howard "are frequently stopped as if by magic by the work of insect enemies of the pests" and this work is very effectively done in many cases by parasitic insects. Taking advantage of this habit of parasites, several eminent men in various countries have begun to import and propagate natural enemies from different countries and some of these efforts have proved successful. I know of one case myself of an American Entomologist carrying 15000 live parasites of the Guava fruit fly from Bangalore to Australia in order to try it against the fruit fly pest there. But with regard to this method of checking pests there is

a great diversity of opinion between Entomologists as to the final results produced by such a transportation of insect forms from their original homes to new places.

ii. INSECTS AND FLOWERS:—We now come to a most remarkable and wonderful part played by certain insects which in many cases results in great benefit to the cultivator. I mean the relations between insects and flowers of various kinds. Botanists will tell us that cultivated plants of various kinds are so constructed that cross fertilization takes place by insect agency in many cases. This beneficial work is done by insects of various kinds which feed on the nectar of flowers; as the insect visits one flower after the other it carries unconsciously some pollen on its limbs or body and deposits the same on the next flower of the kind it visits, in this way bringing about what is called cross-fertilization. Various important plants like apple, pear, etc., depend on bees for this work while plants like Tobacco Petunia etc., have to get the help of night-flying moths. In several cases where plants come into blossom and do not bear fruits, one of the reasons might be the absence of proper insect agency for cross pollination. One remarkable instance of this close relation between an insect and a plant is found in the case of the edible smyrna fig the proper fructification of which entirely depends upon a species of minute wasp called 'Blastoptaga.' The presence of this insect appears to be a *desideratum* for the proper pollination of the fig. In the Coffee plantations of the hill districts in Southern India it is beginning to be felt that the indiscriminate destruction of honey bees by hill tribes interferes with the proper pollination of Coffee flowers by these useful insects, and this question is now being investigated. This aspect of the activity of insects for doing good to the agriculturist will in itself form a theme for special study, since very little is on record regarding this fascinating subject.

iii. INSECTS GIVING USEFUL PRODUCTS:—We now come to the third aspect of insect activity for good. Though last this is not the least important of all; for in this case the insects concerned instead of helping the cultivator to fight his insect enemies or his flowering plants to be pollinated bestows on him certain things which may be regarded

as priceless objects which man gets from the insect world—I mean Silk, Lac and Honey. Of course this aspect of insect activity is not directly concerned with ordinary agriculture but I venture to think that Silk-farming, Lac-cultivation and Apiculture are more related to the science of Agriculture than any other. I do not propose to go into detail regarding each of these important items but I simply make mention of these to show the agriculturist that there are among insects such wonderful creatures like the silk worm and the honey bee which have been giving man from time immemorial such remarkable products as silk and honey, the former forming some of the finest of man's garments and the latter one of his best delicacies. Apart from these three important members of the insect world, there are others which serve as objects of ornament, medicine and even food for man in different parts of the world. Perhaps some of you are surprised at my last remark; but it is a well known fact that winged white ant-eaters form a delicious article of food among some of the low caste cultivating classes in Southern India.

NECESSITY FOR GENERAL KNOWLEDGE REGARDING INSECTS:—Gentlemen, I believe I have given you a brief summary of the different insect activities as they affect the agriculturist. I think it proper before I bring this to a close to add a few remarks regarding the practical side of the question. It is perhaps clear from what I have said above that the intelligent farmer who would wish to spare as much as possible of his valuable crops from the ravages of noxious insects, and who would like to make the best advantages of useful forms in every way, will do well to acquire some general ideas regarding the elementary facts about insects and their ways. It is in fact to impress this side of the question that I have availed myself of this opportunity to speak to you. The possession of a few fundamental facts regarding insects and their habits would prove a great asset to one who wants to devise measures either to destroy or to encourage the multiplication of an insect of economic importance. As I have already stated the number of insects is legion and the methods in which they lead their lives is diverse, but it is not difficult to gather a few primary facts applying to all insects in general which will go a great

way in guiding the farmer to deal with the situation more effectively. "The annual loss suffered by Agricultural communities through ignorance of Entomological facts is very great. Unless the farmer has correct information as to the best manner in which to combat insect pests he is likely to suffer loss of a serious nature." The first and foremost thing a farmer should know in connection with insects is to distinguish bad ones from those that have been proved by scientific research to be beneficial. This can be done by first possessing a general knowledge of insects, and then by the more effective and practical method of observation in the fields by the simple "art of seeing which is so useful, so universal and yet so uncommon! This knowledge will avoid mixing up good and bad insects and the latter to escape scot-free. From among noxious insects affecting a plant the farmer can by experience distinguish those insects which are major pests or those causing serious damage to the crop from others of minor importance which hardly ever do any appreciable harm. From the point of view of the nature of attack on plants almost all insects fall into two great groups—one includes those that have their mouth parts adapted for cutting and tearing plant or animal tissue such as grasshoppers, beetles and caterpillars. The other group contains those which are unable to cut or tear but are only able to suck up liquid nutrition from plants or animals such as flies, mosquitoes, bugs, butterflies and moths. A plant attacked by one of the biting insects will show torn leaves, cut up shoots, or scraped bark, while if it is a sucking insect the plant will keep its form but will show a regular fading away of the part due to the drainage of plant sap. A knowledge of this fact will enable us to find out the particular group of insects biting or sucking which causes the damage and this will help us in devising the control measures suited to each.

LIFE HISTORIES OF INSECTS:—There is one important feature among insects in general which all farmers will do well to have some clear ideas about. What I mean is about the life history of insects in general or what is technically known as Metamorphosis among insects—a series of striking and remarkable changes undergone by many insects as they pass from their childhood to maturity. This is a very

common phenomenon taking place unceasingly in nature all around the farmer but about which very few, if at all, know anything. The passage of a common butterfly from the tiny egg to the worm like caterpillar feeding on leaves, the change of this caterpillar into an apparently dead object—the chrysalis, and final change into the winged butterfly—all these phenomena are still closed pages to our average farmer. The life histories of all insects follow one or other of two ways. Those that show all these four stages, egg, caterpillar or grub, pupa and adult. Butterflies, moths, bees, wasps, and flies etc., all follow this method while there are others like the grasshoppers, bugs etc., which do not possess a pupa stage but have young ones more or less similar to parents but only different in size, colour and want of wings. With this knowledge we can at once have a general idea of the life history of any insect which might attack our crops.

FACTS REGARDING CONTROL MEASURES:—It must be emphasised that the life history of an insect is the most important factor to be considered before any measures are adopted to destroy it. For, unless the life history is clearly known of each insect it is impossible to state when, where or how to strike it at its weakest point. There are some that lay eggs in clusters of a hundred or more in well-exposed places while in the caterpillar or adult stage they are very active, dispersed and difficult to check. In such cases the insect can be easily and effectively checked by collecting these egg clusters and destroying them. There are others in which the caterpillars or grubs feed gregariously—thousands of them in each leaf or branch, while there are still others having their vulnerable point in their adult condition such as flying to lights etc., When such cases are known it will be found very easy and effective to adopt the control measures in time. An ignorant farmer allows these vulnerable points of insects pass unchecked and finds himself in a fix when the creature has increased in numbers and assumed serious proportions! The important points which we learn by following the life history of an insect are its distribution, nature and extent of injury to crop; the period it occupies in each of its different stages; its habits, its natural enemies, the other plant or plants on which it feeds, its natural haunts and

a number of other points will be of very great use to devise control measures. To take only one example out of the many well known measures the coconut beetle—the cultivator is often ignorant of the fact that the earlier stages of this beetle are spent in his manure heaps and dead trees; and if only these are properly attended to there will be a remarkable reduction in the damage caused by this pest. The importance therefore of the knowledge regarding life histories and habits of insects cannot be exaggerated.

When once we get some idea of the ways of an insect pest, methods of control become a matter of common sense. It need hardly be stated that the best remedial measure is the one which is practicable, cheap and effective. Our farmer friends want ready made medicines which will drive any kind of noxious insects like magic. But one who has known about the ways and habits of various insects can easily understand the folly of such a request. The good old saying that 'Prevention is better than cure' is nowhere more applicable, than in controlling insect pests. All control methods fall into one or other of the three, viz. Agricultural, Mechanical or Insecticidal. The chief of what are called agricultural methods consist of clean cultivation, a proper rotation of crops, applying of good fertilizers etc. There is the common custom of leaving the stubbles and plant remains after harvest in many cases. The farmer should remember that these should be destroyed or properly disposed of, else they harbour pests which will attack the next growing crop. We often find this neglect in the case of many plants especially, cholan, cotton, brinjal, and cucurbitaceous plants. There are certain fertilizers which when applied to a crop, while keeping insect pests away, either do not affect the crop injuriously, or in many cases make the plants grow with additional vigour. Among others, Kainit and the various kinds of oil seed cakes, possess this property. Drainage, irrigation, ploughing etc., at the proper time and with a knowledge of the insects they affect chiefly, have all their insecticidal value.

Under mechanical ways of checking pests come the various contrivances used to control insects. Handpicking, use of hand nets and bags, the use of light traps etc form some of these

useful methods. Insects like grasshoppers, plant bugs etc. can be easily checked by the use of hand nets and bags. There are certain insects which have a peculiar attraction for lights and these can be trapped by means of a light hung in the middle of a field. Cockchafer and various other insects can be controlled in this manner.

Then come what are called Insecticidal methods or the use of various chemical and medicinal preparations to kill or drive pests. The common method of dusting ashes over insect attacked plant is a matter of common knowledge to all. There are various other crude local methods of this kind; but in many cases the methods are adopted without knowing the why and the wherefore of the operation. To dust ashes over a plant which is being killed by a stem borer is simply to waste time and material!

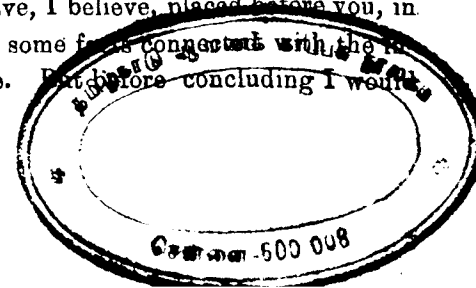
INSECTICIDES:—Insecticidal methods are of recent introduction into India and it must be stated that in a poor country full of small holdings like this, insecticidal methods will not commend themselves to ordinary ryots, nor will they be found practicable in the case of extensive field crops. They will however be found very useful in dealing with insects affecting orchards vegetable and ornamental gardens. In these cases and in some valuable industrial crops like Cotton, Coffee etc insecticidal methods might be found practicable, paying and effective. Various kinds of what are called insecticides are sold in the market under different names. But most of these can be brought under two kinds; those called stomach-insecticides which affect biting insects generally and others called contact-insecticides which have power chiefly over sucking insects. Thus the knowledge of the mouth parts of insects, as stated once before, helps one to select the particular kind of insecticide for use. Against plant lice, active bugs and other bugs called scales contact poisons are generally used. Against leaf-eating caterpillars, beetles

grasshoppers etc., if insecticides are to be used, generally stomach poisons are selected. A very important contact poison which will be useful against many sucking insects—and some of our worst pests are these—has been found in Fish Oil Soap, a substance for which we are very much indebted to the Fisheries Department. This substance is manufactured at the Fisheries Depot in Malabar. There are others called fumigants used to fumigate insect-infested things and the process of fumigation is employed in the case of insects affeting stored products.

KNOWLEDGE OF NATURAL ENEMIES:—Before leaving the question of control measures one important matter which I wish to impress on farmers is that they should encourage all natural enemies which more than any artificial methods control insect pests to a remarkable degree. The indiscriminate destruction of insectivorous animals such as various kinds of birds, lizards etc. should be discouraged. The crow, the mynah and various other birds help the farmer a great deal and these should be allowed to have free play. The method of allowing ducks freely into paddy fields infested with grasshoppers cannot be too highly commended.

CO-OPERATION:—Co-operation which plays now a days a very important part in most human activities has its place in this subject as well. The control of pests in various agricultural mechanical, and insecticidal ways will be effective only if there is co-operation between neighbouring farmers. One farmer might clear his fields of weeds or bag the insects in his fields, but from the adjacent field the owner of which is idle the pests again come and attack and make the work of the first man fruitless. So a great deal of co-operation is also found necessary in such matters.

Conclusion Gentlemen, I have, I believe, placed before you, in however unconnected a manner, some facts connected with the influence of insects on Agriculture. Before concluding I would



just add a few remarks regarding what the Government has done and is doing in this matter. To reduce the frequent losses brought about by insect pests and to help the farmer who may not in various cases be able to work single-handed, the Government has appointed special officers to give expert advice to the farmers in such matters. These officers are doing their best in this direction. There is also a good deal which the expert has to learn from the cultivator regarding local conditions etc., besides various observations in the fields which the farmer is able to make, being the man on the spot. Most of the important insect pests have been noted and the life histories of many of these have been worked out. We are now at a stage when the real work of making practical use of the knowledge has come and with the help of the intelligent farmers it is believed that the work will progress successfully. The average Indian ryot is a very intelligent and shrewd individual, not only ready to take up whatever suggestions are given to better his condition, but fearless to point out our mistakes. Mistakes we do make—and who does not make mistakes?—and is only through mistakes that we finally succeed! As one example of the readiness with which the Indian agriculturist takes up a suggested remedial measure may be mentioned the case of the beetle pest that recently did considerable damage to stored paddy in Chingleput and South Arcot. People were convinced of the success of the measure we suggested—(viz. Fumigation with a chemical) and there were many demands for fumigating insect attacked paddy!

Gentlemen, the whole subject resolves therefore into this viz. Education of the farmer and his children in the simple facts regarding insects in other words—Nature-study in Rural schools.

In course of time as the farmer becomes interested in these matters and helps and co-operates with the scientific experts in fighting his pests, a great portion of India's produce could be

saved from the clutches of noxious insects and added to the material wealth of the country.

[Mr. Ramakrishna Aiyar then showed and explained a series of coloured slides which illustrated the life histories of several of the most harmful and most beneficial insects of India. These included the rice stem borer, the rhinoceros beetle, a weevil attacking stored grain, the mulberry and castor silkworms and the lac insect.]

The Students' Union. Contributed.

When the excitement of the Annual gathering at Coimbatore has died away, and the newly elected committee of the Union get to work, it is time for the union members, and those who have the welfare of the union at heart to take stock of its position and see whether their union is really a power for good—whether it is indeed a power at all and whether when members have paid their subscriptions and read their monthly Journal, they do not consider that they have done their duty by the Union. If this is so, the case of the union is a deplorable one. It is true it has for the past six or seven years been successful, it has attracted considerable notice and to the casual observer of its finances, it might be considered in an extremely flourishing condition. We would not have it otherwise, but is this enough?

The objects of the Union and how they are to be attained are set down in paras 2 and 3 of the rules which are published from time to time in the union journal. The celebration of College Day; the holding of a Conference at that time; and the publishing of a journal are three important means whereby the objects of the union are to be obtained. The fourth duty of the union as therein set down, namely, to maintain a corrected list of addresses of old students, is at present so far as is known, in

complete abeyance. At first and in the beginning this programme was undoubtedly sufficient and the success which has followed the union so far in carrying this out, speaks well of its power and influence. But after six years it is time that this programme be extended, because it is certainly insufficient to attract the subscriptions and donations which the union has in the past been able to expect. The union cannot plead poverty and lack of numbers since both its funds and its members are increasing every year.

Criticisms to have any value must be constructive and certain lines along which work may develop may be indicated in the short space of this article. The union could surely undertake more educational work; it has already given assistance to a student taking the higher course at the College and this kind of help might be extended in other ways. It could take up the work of translation of useful books which are not copyright and which could be sold by the union and its members at cost price. We believe that the question of doing something to educate the farm labourers at the various agricultural stations has been suggested. Work of this kind must necessarily be concentrated, at any rate at the start, and this is a difficulty which the union will have to face. If the work is started in too scattered a manner it will run the risk of failure. An annual medal might be offered by the union as a reward for the member who, apart from his official activities had done most for the union during the past year, and in order to stimulate suggestions, a prize, and a substantial one at that, might be offered for the best essay on the subject now under discussion, namely the means of increasing the utility of the union, though it might be objected that the competition for the essay prizes which have in the past been offered through the union had been woefully disappointing.

In the way of investigation, sub-committees of the union might do valuable work. To take a subject at random, the ques-

tion of leases could be taken up and alternative standard lease agreements worked out as a result of the experience of union members whether both public or private. Another suggestion is that the union might pay the expenses of members sent to other parts of India or even abroad, to study special problems. A student interested in sugarcane might for instance be sent to Java, and a part or whole of his expenses paid.

The welfare of the students in residence at the college might be increased by spending money on the tennis courts or on the coming library and reading rooms. The equipment of the library has yet to be taken up and will be a serious drain on the funds of the student's club. The above are a few vague hints which are not intended to be in any way final and which may for all that is known have already been discussed by the members of the union. The point is that the union must do something and do it soon. It cannot continue accumulating funds without showing that it knows what to do with them. It is no excuse to say that reserve fund is necessary because it is not. The reserve of the union lies in the good opinion of its members and friends and that will only be gained by a full programme of honest and useful work. It is better to spend too fast than too slow and if such expenditure is obviously devoted to good objects the union can if necessary appeal for extra subscriptions, on the ground that it has earned it by "something attempted, something done."

"HUSTLE."

Better preservation of cattle manure on the West Coast.

That urine of animals is of very considerable value is a fact not universally known. Urine contains large quantities of valuable plant food. It is unfortunate that liquid manure is so liable to run to waste either by evaporation, by drainage or by

washing with rain water. The serious mistake therefore in the existing system of collecting cattle manure in Malabar is the total neglect of the liquid portion. Urine is generally considered more of a nuisance than a useful commodity and every endeavour is made to drain it away from the cattle-shed instead of preserving it as carefully as possible. Then manure inside a cattle-shed has the tendency to become offensive to cattle, it is frequently taken outside to a pit behind the shed and the whole of it is exposed to heavy rains and to the hot sun. Ryots are fully aware that their manure thus neglected is devoid of a considerable amount of its *Karum* or strength, and yet they make no effort to mend matters.

On the other hand in South Canara from time immemorial, the ryots have been used to collect cattle-manure in a much better way and that is by providing bedding for their cattle. They make it a point to take some fresh litter daily into the shed. After some time—3 to 6 weeks—they remove the accumulated mixture now composed of the voids of the cattle and the litter added, which they make into a proper heap outside the shed.

The best way of preserving cattle-manure is to make the cattle stall 2 or 3 feet deep and to spread some litter as bedding every day so as to mix with the dung and absorb the urine voided. Green leaf, dried leaf, neglected or useless straw, dried weeds, paddy chaff, or any refused organic matter might be used for this purpose. If, however, none of the above are available, then dry earth should be used as bedding. The above mentioned materials when added, absorb and ensure the preservation of the urine. Treading by the cattle makes the whole thing compact. The stuff thus obtained may, if necessary, be carried straight away to the fields whenever required. For several reasons, the bulky manure, though a little more expensive to cart to fields, is of considerably greater value than small quantities of

pure cow dung, particularly so in Malabar where a heavy rainfall is obtained. The bulky manure thus procured in the cattle-sheds, apart from the manurial ingredients it contains, brings about an improvement in the physical condition of the soil which is most beneficial to the crops grown thereon. This applies to practically all kinds of soils and of crops.

After the burst of the South-West Monsoon the Malabar ryots even if they have the will and the means to apply green leaf as a manure to their land have no time or labour to attend to such work. They will then be hurrying on with the transplantation of paddy and the heavy rains and consequent floods interfere to no small extent with the ordinary work. But if according to the above system 2 or 3 bundles of leaves are taken to the cattle shed every day, quite an appreciable quantity of manure will be available at hand within their own cattle-sheds, and the expenditure thus involved is very small indeed compared to the high price which has to be paid for green manure to be applied direct to the land. On the Taliparamba Agricultural Station it has been possible to obtain as much as 12 cart loads of manure in one year from a byre holding only one pair of animals, where as the Malabar ryots do not get even 2 cart loads out of a pair of cattle.

There is a prevalent idea amongst many ryots that it is injurious for cattle to stand continually on the manure accumulated in the byres. This is quite an erroneous idea. On the Taliparamba farm this same practice has been in vogue for the last 9 years and the cattle have had no complaint on this score. But care is taken to put in some bedding or other ever day. In February, March when the manure has a tendency to become heated a pot of water is now and then scattered over the litter, but rain water is never allowed to get into the shed. The manure is only carted from the shed once a year, which means that the cattle remain day and night throughout the year on the accumulated stuff. It

is strongly recommended to every man who keeps cattle and uses their excreta for manuring his land that the above-system of collecting manure may be adopted in the place of the wasteful one now in vogue.

If it is not possible to keep the manure such a length of time in the sheds, then as a first step it may be periodically removed (about once a month) to a pit dug in the ground close to the shed. It is important that this pit should be properly roofed so that rain water will be prevented from washing away the valuable manurial ingredients. The manure thus collected will be of superior quality and at the same time a greater quantity than that commonly obtained by the present wasteful system.

M. GOVINDA KIDAVU,
Farm Manager, Taliparamba.

Notes.

Manure Society in Tanjore District:—Our readers will remember that one of our Saidapet diplomates, Rai Sahib, A Seturama Aiyer, read a paper at the Agricultural Conference, 1915, on the possibility of putting up machinery on a small scale for crushing bones and phosphatic nodules for use as manure on the soils of Tanjore which, as the Soil Survey of the District indicates, are generally deficient in phosphoric acid. We are glad to hear that Mr. Seturama Aiyer erected a disintegrator to be worked by his 9 H. P. Oil engine already existing in his garden at Needamangalam and also constructed a store room at a cost of Rs. 1500.

An application has been submitted by several prominent Mirasidars of the District, himself being one of the signatories, to the Registrar for registering a Co-operative Manure Society which will undertake to purchase, crush, mix and sell manures, primarily to members. Apart from the usual distribution of

profits to the share-holders, according to the number of shares held and to the purchasers, according to the quantity purchased, a distinct feature of the Society is that the pariahs who generally gather the bones will receive, in addition to the cost price of the bones, a share of the profit calculated on the quantity supplied by them. These people do not subscribe to the share capital, but will be called Associates. It is good that the high caste Hindu Mirasidars are going to associate themselves with the depressed classes. Orthodoxy may deter a caste Hindu from gathering whole bones, but are the Mirasidars going to depend on the pariahs to spread the crushed bone meal on their lands? Apparently not. (M. R. R.)

Cattle poisoning by young cholam:—Experiments conducted at Bihar about this show that even under similar conditions of climate and rainfall the same varieties of cholam of the same age give widely varying quantities of the poison; that the crop of one field may be dangerous, but that of a neighbouring field may be quite innocuous. It is possible that this is due to the difference in the rate of germination, owing to the differences in the moisture contents of the soil in which they grow.

It has not been exactly ascertained under what condition of cultivation and growth and at what periods, accumulation of the poisonous element in the cholam becomes greatest.

A healthy and a very vigorous growing crop contains considerably less amounts of the poison than a poor stunted crop. If owing to persistent unfavourable conditions a fodder does not grow and remains stunted and poor, containing a dangerous amount of the poison the cultivator will be well advised to store the green fodder in silo. The experiments show a crop contained on the 14th July as much as 3 grains of the poison per pound. Only 16 lbs. of this stuff is quite sufficient to kill a cow. A month after putting the same crop into a silo the quantity of

available poison was reduced to .008 grain per pound and 500 to 600 lbs. of this stuff will be required to produce fatal effects in a cow. It appears therefore clear that even stunted and poor grown cholam will be perfectly safe when fed to cattle after storing in for a few weeks. *Bihar Agricultural Journal.* (K. R.)

Process of making milk with soya bean:—According to a United States patent artificial milk is prepared from Soya bean as follows:—Soya beans are ground to a coarse powder, a small quantity of coconut oil added if desired, and the mass emulsified with about an equal amount of water at a temperature above 80° F (27° C) in presence of the alkali, e. g., sodium bicarbonate and lime the liquid portion is separated and heated for several hours below its boiling point; or the emulsion is heated first and filtered afterwards. (B. V. N.)

Estate Notes.

The Officers' Club:—At a meeting of the General Body held on the 3rd July for the election of the Office-bearers for the new year 1916—1917, Mr. K. Rangachariar was re-elected President, Mr. Y. Ramachandra Rao was re-elected Secretary, and Messrs. M. R. Ramasami Sivan, P. A. Subramania Aiyar and K. S. Puttaiyar were elected members of the Managing-committee, Messrs. K. S. Subramania Aiyar and M. R. Venkatarama Aiyar were elected Auditors.

The Officers' Mess:—On account of certain restrictions placed on the bachelor officers of the colony with regard to messing in the Students' Hostel, a separate private mess was started by them in July. It was first lodged at Mr. Raghavachariar's quarters with his kind permission as he happened to be a "grass-widower" at the time. Recently it has been shifted temporarily, through the kind permission of the Principal, to the kitchen and dining

hall of the vacant students' Block No. 1. There are some proposals in the air for making the mess an adjunct of the club so as to ensure its permanency even in case the members change, and to provide a small out-house near the club-building to house the lodge. It is also proposed incidentally to enlarge the building by constructing verandahs on the other three sides so as to remedy the cramped condition of the club of evenings.

Conversations:—i. On June 29th Dr. C. B. Rama Rao gave the members of the club the benefit of his experiences during his tour round the world, and his stay in Great Britain. He declared it was not impossible for a strict vegetarian like himself to go round the world without violating his principles.

ii. On July 6th—Mr. Lakshman Reddi, Bar-at-law who had come from Ooty on a visit to the Agricultural College, gave an informal talk about the "Indian Students in England".

Tournaments among the members in Tennis, Badminton, Ping-pong and Cards have been started in connection with the ensuing Second Anniversary celebration of the New Club Building.

Games.

Hockey with the Reserve Police:—An interesting Hockey Match was played between the Reserve Police and A. C. and R. I. Attacking vigorously from the start Mr. Parnell drew first blood for A. C. and R. I. Then again play veered round the opponents' goal. The half-time intervened, shortly after and on the teams crossing over play continued much the same as it was in the early half and the A. C. and R. I. scoring one more goal by Mr. Parnell. The opponents resumed the aggressive and with a beautiful combination they were visiting the A. C. and R. I. goal every now and then. When the match was about to be closed, the opponents had scored two goals and the game was drawn.

Hockey with Forest College :—Another Hockey Match was played with the Forest College in our grounds. The game was very exciting and one of the opponents drew the first blood after a smart run along the right, all by himself. Leading by one goal, they were growing stronger in front, but were unable to enhance their lead far a second time. Shortly after the Principal of our College netted a ball which brought the game to a level for the time-being. Onkaram put 2 goals to his credit. Leading by 2 goals, play in the second half was let open to the opponents and they took advantage of the backs in scoring two more goals, thus bringing the match to a draw.

Departmental Notes.

The Board grants combined privilege leave and furlough for two years to M. R. Ry., R. Ramaswami Ayyar, Agricultural Demonstrator, with effect from the 24th July 1916.

Mr. K. P. Sundara Ayyar, L. Ag., Assistant Agricultural Demonstrator having done good work in connection with Cotton Improvement in Tinnevely is promoted to the Upper Division on the 50-5-125 scale sub-protem to fill an existing vacancy with effect from 16th July 1916.

Mr. S. Viravarada Raju will continue to act vice Assistant Farm Manager M. R. Ry., V. S. Narayanaswami Ayyar on privilege leave up to 15th July 1916 and will be on probation in the vacancy caused by the promotion of Mr. K. P. Sundara Ayyar in the Upper Division from 16th July 1916.

Mr. K. Adinarayana Rao L. Ag. of Hindupur, Anantapur District is appointed as Agricultural Inspector in charge of the Dairy in Hebbal Experimental Farm in the Mysore Service.

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N. B:—Contributors are requested to send in their contributions written legibly in ink on one side of the paper only.—Editor.

Editorial Notes.

In a recent issue of the Journal of Dairying there is an article in which an English student records his opinions on the dairy farming of the country. To him who comes from a country where dairy operations are brought almost to perfection, where high class breeding is practised to a nicety, and where the methods adopted in housing cattle are admirable, the conditions as they exist at present in India appear to him careless if not reckless. To bring India on par with other dairying countries of the world he opines that the breed should be kept pure so that breeds suitable for draft purposes should strictly be bred for that purpose alone rather than have an indifferent so called 'dual purpose' animal. Where practised, selective breeding takes a long time to give results and to obviate this difficulty

Indian farming through western spectacles.

he suggests the importation of foreign breeds with a view to grade the country animals. We however doubt if the importation of foreign cattle will be a success all over, as in many parts of the country, climate is against them. With regard to the proper housing and care of cattle we heartily join him in his criticism of the deplorable state of affairs as at present exist. He quotes Karachi where cattle roam about and eat the rubbish thrown in dust bins. In our own Presidency, to take examples at random, at Taliparamba in North Malabar cows roam about throughout the night and the highways are their habitation. They truly depict a picture of the homeless wanderers of the land. At Kurnool the owners drive their buffaloes at dusk to open spaces, possibly to lessen the heavy municipal scavenging bills, but nobody seems to object to drinking their milk when they return home after their night's exploits. This is sanitation with vengeance indeed!

Even in an advanced country like England the prejudice against the employment of women labour on land is great. There are certain parts which have never employed women at all and the prejudice in such places is still greater. Owing to the War, however, we have been hearing of women being employed in many walks of life where prior to war mere man claimed the monopoly and this has been the case even in farm operations like hoeing, weeding, sheep clipping, milking, harrowing and even ploughing in which women are said to do good work. There seems to be no reason why women should not be more largely

Women as
Farm
labourers.

employed on land in our own country. At present they sow and they reap; why not they plough and mow? We would look forward to the day when the *akkals* and *ammals* of the countryside replace the chetties and goundans in all dairy operations in which women seem to be peculiarly suitable. Anyway they seem to deserve a trial at the Dairy in the College!

We heartily extend our congratulations to Mr. J. Chelva Ranga Raju one of our Vice-Presidents on his promotion as acting Deputy Director of Agriculture of the Central Division. We wish him all success.

We have before us an article summarising the different opinions of many workers in many parts of the world on the poisonous character of young cholam plants. All are agreed that cholam is one of the best fodders for all sorts of cattle in the tropical countries but its disadvantage lies in the opinion that in its young stages it contains in its leaves and stalks prussic acid which is highly poisonous. The author cites cases where cattle have died a few hours after eating young plants in Allahabad, Nebraska etc. It is the opinion therefore of those who analysed the plant that cholam fodder should not be used whether first or second crop till after flowering and that regular growth should be maintained as sudden growth after being stunted, or stunting after good growth seems to increase the poison. It is also considered doubtful whether the poison gets minimised after drying the plants. So far for the scientific opinion.

Poison in
Cholam
plants.

We understand that in the Central Farm at Coimbatore young plants pulled out from thickly sown fields dried for a couple of days and ratoon cholam in young stages have been on several occasions fed to cattle of all kinds with impunity. It is the mamool, here for cattle to eat such plants and it is their mamool not to die! Shall we be favoured with the experience of our readers on this interesting subject?

***The relations between a farmer and his servants and their Improvements.**

Servants are indispensable to a farmer unless his holding is so small that it can be cultivated by himself and his family. The larger the farm, the greater the number of servants required, and the more does the success of the farmer's business depend upon their willing co-operation. In this country unfortunately, owing to the backward condition of both farmers as well as servants, their mutual relations are not generally as healthy as they ought to be for a hearty co-operation in furtherance of their mutual interests. In this essay it is proposed to describe the various aspects of the relations between a farmer and his servants as they exist at present in the Madras Presidency and to suggest as far as possible means of improving them to the best advantage of both.

Servants employed by farmers are of two classes, permanent and casual. In the census reports of the Government, the terms 'farm servants' and 'field labourers' are used for the two classes respectively. Farm servants are regular employees receiving monthly salaries and sometimes other emoluments also. On every farm, a certain number of these usually about the same as the number of pairs of draught cattle owned by the farmer, are employed and whenever these cannot cope with the work, field labourers receiving daily wages are casually engaged.

*Munagala Prize Essay by Mr. G. Jogi Razu.

To get through the various agricultural operations in time, the farmer should be able to command the required number of servants, both permanent and casual. To be economical, the wages he has to pay should be moderate, and more than this, the servants should be efficient in their work. The interests of the farmer in connection with his servants are thus dependant upon three factors viz., their availability, wages and efficiency.

Servants entirely depend, for their livelihood, upon the earnings from their labour, and can never afford to be idle. They therefore, want regular employment. Their livelihood also depends upon the adequacy of the wages they get. Their comforts are largely based on the treatment their master accords them. Continuity of employment, adequacy of wages, and fairness of treatment are thus the factors governing the well-being of servants.

The farmer in aiming at the furtherance on his own interest, often overlooks those of the servants. The servants too, have little sense of duty and frequently fail to show sufficient regard to their master's interests. In each party seeking its own advantage or ease, a certain amount of conflict naturally arises in their relations. How to reduce this conflict to the minimum, and effect a compromise conducive to the best interest of both, is the problem. A close study of each of the factors governing the interests of each party, and a clear insight into their mutual relations in respect of each of these factors may lead us to the solution.

Availability of Labour.

This is the foremost of the farmer's needs. There may be a good deal of variation in the availability of labour in the different parts of the country but there is no doubt that on the whole it has been getting scarce. In the Madras Presidency, while there was in 1901 one farm servant or field labourer available for every 3.6 acres of crops cultivated there was in 1911 only one for every 4.8 acres. The difficulty in procuring labour is most keenly felt in the large rice growing tracts like the Kistna District and in the Agricultural areas in the vicinity of cities and large towns.

The chief cause of this scarcity is the large increase in the demand for labour from all quarters. There has been a large increase in the area under cultivation. During the period of ten years 1901-1911 the area under the various crops in this Presidency increased by about 35% while the number of farm servants and field labourers increased in the same period by only 2.5%¹. At the same time the manifold activities of towns and cities, mills and other industrial concerns, the construction of buildings, roads and railways, are drawing away a large number of labourers from the rural tracts and large numbers are also emigrating to other countries.

The increase in the area cropped is, of course not only inevitable but also necessary to meet the needs of the growing population. But the tendency of the labourers to quit rural areas, owing to the availability elsewhere, of employment at all seasons of the year and on higher wages, has to be minimised by the farmer giving the same facilities and making his service equally attractive. These matters will be discussed later on in some detail but it may be noted here that however liberal farmers may be in paying their servants or however well they may treat them, all labour cannot be monopolised by them the other works being left alone. Every effort should therefore be made to economise labour by increasing the efficiency of the workmen themselves and by the use of labour-saving appliances.

A minor cause—yet a serious one—for the scarcity of labour is the growth of indolence, among both farmers and servants. Some farmers who were hitherto cultivating their fields, themselves, now get all the work done by servants, owing to laziness or false ideas of dignity. The demand for labour is thus increased, the more so, because the servant owing to his indifference scarcely turns out as much work as the master himself can do in a given time. Some men of the servant class also have now acquired lands for themselves and are no more available as coolies even when they have no work on their own holdings. In some cases indolence has even gone further. Mr. Keatinge, Director of Agriculture, Bombay, writing about labour scar-

¹ These figures were calculated from the Census reports and agricultural statistics published by the government in (1901-11).

city in that Presidency thus describes a custom which is said to prevail in some parts. "In the Thana District" he writes "a man who wishes to engage a daily labourer goes to the hut of a 'warb' or Kalkari and asks the man's wife whether they have sufficient 'nagli' (Eleusine coracana—their ordinary food) for the day. If she says 'yes' he passes on to the next hut." This trait of character, so well illustrated above, is no peculiar to the people of that one district in the western Presidency, but can be observed every where in Southern India to a smaller or greater extent. In the interests of both farmers as well as servants this growth of indolence has to be strongly discouraged, the chief means for this being education—not only mere teaching to read and write but real education which creates a love for labour and earnestness in work.

Continuous Employment.

This is the first requirement of servants. The casual labourer in the rural tracts finds great difficulty in securing employment in seasons of agricultural inactivity. In the case of complete failure of rains even permanent servants are very often thrown out of employment the farmer himself finding no means of supporting his family and livestock. Even granting that there is no lack of employment for the labourer there is some advantage both to the employer and to the employee in their mutual relations as master and servant continuing for a sufficiently long period. By long association their interests become to a great extent interwoven; mutual confidence is established; the master can largely rely upon his servant for the proper execution of work; and the servant can count upon his master's help in all contingencies of life. In employing servants the farmer should bear in mind this aspect of his relation with his servants, and as far as possible offer them uninterrupted employment. To be able to do so the farmer should frame his cropping scheme in such a way that the work will be distributed as evenly as possible throughout the year. The more efficiently he is able to do this the less is the chance of his men being idle at any time or of his requiring a large number of extra labourers at a time when they are not available. The creation of irrigation

*Agricultural Journal of India Vol. X P. 276.

facilities and the inclusion into the scheme of cultivation of a fair proportion of garden crops will to a great extent enable the farmer to give continuous employment to his servants.

Even in the employment of daily labourers, especially in the transplanting and the harvest seasons, the farmer should see that once a set of men or women are employed, their services are not discontinued till the operation is completed.

Wages.

The question of wages may be discussed from both the farmer's and servants' stand point at the same time. The farmer wishes to get labour cheap and thus secure a greater margin of profit. The servant is poor and will have to starve if he does not secure adequate wages. No doubt, wages have somewhat risen of late, but the prices of foodstuffs too have risen correspondingly or even more. The servant is not therefore any the better for the rise in wages; nor is the farmer any the worse for it, as he now gets a higher money value for his produce. In securing servants the farmer has now to compete with other industries which attract large numbers by offering higher wages than what the farmer has been accustomed to give. Unless he too offers as much as others do, he cannot get a sufficient number of servants and his work will suffer. Farmers in other countries and even in some parts of this country, the Chenab Canal colonies for instance pay much higher wages than in this Presidency, and yet obtain good profits by increasing the efficiency. In fact, it is more the inefficiency of the servants here, that swells the labour bill, than the rate of wages.

In considering the adequacy, of wages the terms on which agricultural labourers are usually employed and the manner of payment have to be taken into account. In this Presidency there are two principal systems of service in vogue, the cash payment system and the grain payment system.

The cash system is simple though rarer of the two. It is usually adopted when no grain crops are produced on the farm. Absentee

landlords and gentlemen farmers prefer this system as they find it difficult to control the emoluments which the servants receive under the latter system, details of which will be referred to presently. In the cash system the servant receives a monthly pay Rs. 5 to 7. His working hours are from day break to sunset with intervals for breakfast and midday meal. Besides petty festival presents the servant usually receives nothing in addition to his pay.

The grain payment system is very widely prevalent in the Madras Presidency. It somewhat varies in detail in different parts but the main features are the payment of a small monthly wage in kind and an extra allowance of grain in the harvest season. In the Godavari District, for instance, 20 to 30 kunchams of paddy or other grain is the usual monthly wage. This may be worth 3 to 4½ rupees the grain given being usually of an inferior sort. The quality of grain allowed to each servant on the thrashing floor usually amounts to about a putty (80 kunchams) including light grains, sweepings and may be worth Rs. 12 to 15. Besides this and the monthly pay each servant receives a small quantity of grain at the sowing time and a bundle or two of sheaves at the time of harvest. For the pongal festival a cloth is usually presented. In some places it is usual to provide the servant with a pair of country shoes and a blanket annually. The whole value of the grain and other emoluments including the monthly wage may thus amount to Rs. 60 to Rs. 75 per annum or Rs. 5 to 6 per mensem.

In some parts it is the practice to give a ball of ragi food or rice conjee to the servants at midday to prevent them from going home at that time, the monthly wages being at the same time cut down slightly.

In the cash payment system the servant usually receives a little more per mensem than the value of the average monthly emoluments in the grain system, but there is no real advantage in this, for, in buying everything from the petty dealer in the village, he does not usually get his money's worth. In the grain payment system though the stuff he receives is inferior, its quantity is larger and keeps the

family well above starvation. With the earnings of his wife he can buy the other requisites.

In the cash system the servants have little interest naturally in the welfare of the crops, for, their emoluments do not depend upon the yield. In the grain system, the emoluments servants get on the thrashing floors are to some extent proportionate to the yield. Servants under this system are therefore inclined to be more efficient than under the cash system. The farmer has in the grain system a stronger hold on the servants and the latter will have no tendency to run away in the middle of cultivating season as cash paid servants often do, lest they should lose their emoluments in the harvest season.

The grain payment system, as now adopted is not however without defects. The chief one is that the emoluments which the servants are allowed are not definitely measured out but only judged by the eye. However liberal the farmer may be, the servants will still grumble. An inexperienced gentleman-farmer or his easy-going agent may be deceived by the clamour of the servants or the overcautious farmer may deprive the poor servants of their legitimate long-expected reward. This defect however can be easily rectified by fixing the remuneration to a certain per centage of the total yield, and measuring it out, instead of leaving the matter to the judgment of the eye. If the monthly wage is fixed at 60 madras measures of paddy (worth about Rs. 4) and an area of about five acres is cultivated with paddy for each servant employed, a yield of about 5000 madras measures may be expected (a portion of the land being supposed to bear a second crop) and 8 to 10 per cent. of this is a fair proportion that may be given to the servants at the thrashing time.

Another evil attendant on the grain payment system at present, is that the farmer considering the poor monthly wages he pays usually overlooks the pilfering of fuel and other petty things as mammols and this tendency easily extends to grain and other produce. Once this is allowed to establish itself it is difficult to check it however keen the farmer may then be. He should therefore be strict in this matter, raising the wages if necessary.

With the modification and precautions suggested above the grain payment system is perhaps better than the cash payment system under the present conditions both the farmer and the servant benefit thereby.

Casual labour is nowadays usually paid for in cash though in many places payment in kind is still in vogue. The latter is more difficult to manage, occupying a good deal of time. It is usual in some places to feed casual labourers also with ragi or kanji at midday so as to prevent them from going home. The wages are then slightly reduced to meet a portion of the cost of feeding. This method if carefully managed is advantageous to both the farmer and the servants, but the feeding is generally difficult to manage satisfactorily. In some places it is usual for the coolies to get their midday meal from their houses, one out of every ten coolies being allowed to go home for this purpose about an hour before the mealtime. This system deserves encouragement.

Efficiency.

This is the next factor that may be considered. It is an admitted fact that the Indian labourer is far less efficient than those of other civilised countries. The efficiency of a labourer depends chiefly on his physical strength. But the people in Southern India are not generally of such good physique as those of Northern India and many other countries. The nature of the climate may be one of the causes for this, but the economic conditions, habits and social customs of the people have also a good deal to answer for this. Among the labourers a large number cannot, in certain seasons, afford to have two full meals a day. There is no scope for a consideration of the quality at all. The majority have to fare on with very scanty clothing and have to deny themselves most other comforts. Living, as they do, in poor dirty dwellings they are very liable to disease, and have little access to medical aid. Drunkenness is another great evil with the labouring classes, and is responsible for a good deal of their misery. Apart from the evil effects it has on the constitution of the man who drinks, it draws itself a good lot of the family earnings which could have been utilised for good clothing.

The inevitable rise in wages that has been going on, may in due course tend to keep the labourer above starvation but the improvement of his dwellings, medical aid, and the like are matters which call for the efforts of the Government and other administrative bodies. The well-to-do farmer can also render some assistance to his servants in these respects. This aspect will again be referred to the later on.

Another factor which tends to enhance efficiency is intelligence. An intelligent man can easily learn work and do it more thoroughly and quickly than one with the same amount of physical strength but who is dull. An intelligent man can be put to any new work when occasion requires it, this not being easy in the case of a dull man.

An intelligent servant can easily grasp his master's instructions and carry them out. He can also think for himself and attempt to understand the why and the wherefore of what he does. An intelligent man is more amenable to reason and so long as the master himself is reasonable can be controlled more easily than a dull man. The dull servant, through his ignorance may occasionally bring in loss to the farmer by his thoughtless and wasteful work.

Though intelligence is to a large extent a natural gift, yet there is much room for cultivating it. The farmer should take every opportunity of explaining to his servants the rationale of every operation he asks them to do, and thus sharpen their intellect gradually. The question of their education will be referred to in another part of this essay.

However energetic or intelligent a servant may be he does not naturally put all his energies into the work unless he is sufficiently interested in it. Human nature is such and the farmer if he wishes to increase his servants' efficiency should devise means of grafting on their interests to his own. The adoption of the grain wages system and the fixing of the emoluments to be given at the harvest time to a certain percentage of the total yield, as already suggested, are good incentives to sincere and efficient work. Works for which casual labour has to be employed should as far as practicable be let on con-

tract as it is invariably cheaper to do so. But care should be taken that no work in which the loss of efficiency cannot be guarded against, is thus given on contract.

Proper control is another essential to efficiency. The average Indian labourer is lacking in a high sense of duty and for this reason requires an unduly large amount of supervision. Though under the present conditions work has to be extracted from servants by strict supervision alone, the real remedy to the evil is to create in them by proper education, a high moral sense of duty. The object of control should be not to create fear in the servants and thus goad them on to work, but to merely observe and point out any mistakes they may commit. More work can be extracted by creating interest in the work, and love for the master, by the hopes given and the kind treatment accorded, than by constant goading.

The most practical way of inducing servants to work efficiently is for the farmer himself to work with his servants and to lead them. The great efficiency of the ordinary ryot compared with that of the gentleman-farmer is largely due to the ryot adopting this method. The gentleman-farmer is averse to working with his servants and however much of scientific knowledge he may possess, he is seriously handicapped in the actual turning out of the work, the advantage of his improved method being counteracted by the extra cost involved in getting the work done. In England or America we are told even farmers worth several thousands of pounds will not hesitate to work with their servants. It is this respect for physical labour that is greatly wanting in the educated classes of India. If by reforming education on proper lines aversion to physical labour is minimised and intelligent men take to it, the efficiency of labour can easily be doubled or trebled.

Fair treatment.

Besides paying adequate wages in return for the labour of his servants, the farmer owes them a further duty viz., fair treatment. This includes everything he can do to add to their comforts and general improvement—material and moral. Labourers being generally

pariahs or low caste sudras, are generally looked upon as mere beasts of burden and given no opportunities to improve their status. There have been of late some attempt at the "elevation of the depressed classes" but farmers are not directly connected with the movement. Being however in direct touch with their servants they ought to take a more active part.

First, the farmer should learn to be more 'gentle and kind to his servants than he is wont to do, in his daily dealings with them. He should allow for their ordinary weaknesses and should not be too severe over trifling faults. In case of illness or other difficulties he should do his best to enable them to get over the same. Petty sums of money that they may require, under difficult circumstances may be given as donations. If a large sum is required it may be lent on favourable terms. Farmers generally give loans to their servants either when or after they enter services but not infrequently these loans are made means of making the servants more or less slaves. A loan is usually given on a pronote being executed and the amount is expected to be recouped by instalments during successive harvest seasons from the emoluments due to the servant. In many cases, however, the debt is left over to stand so long as the servant continues to serve, the pronote being renewed every three years. The higher the amount lent the lower are the wages usually fixed, and the farmer does not press his servant to repay his dues for he would probably have made up the amount given as loan by the savings in the wages within the first one or two years. The debt continues and the poor servant however dissatisfied he may be with his master cannot leave his services until he finds another who is willing to pay up his whole debt. Interest is not usually claimed if the servant pays up the loan while in service but when he wishes to leave service for better wages it is strictly claimed. Loans like these are of little help to the servants. They should be given with a free heart and their early repayment should be encouraged.

To impress some morals on his servants the farmer may gather them round at nights and narrate short stories or anecdotes. The daily or occasional reading out and explaining to them of the contents

of a newspaper will keep their interest alive. The writer himself adopted this method in one place and found it highly useful in bringing round the most incorrigible of servants.

Farmers may co-operate in opening schools for the education of their servants' children. Examples of schools so opened by farmers for their own sons are known, but to these the sons of servants especially if they are pariahs have no access. For the benefit of grown up boys and young men who have to work on the fields in the day time, night schools may be opened.

It is also the duty of the farmer to see that his servants are provided with healthy quarters. But as the average Indian farmer himself lives in dirty ill-built houses much may not be expected of him in this direction. Some good may however, result if every farmer induces his servants, as far as possible to live on his farm instead of in a common paracheri. The form of huts too may be improved without much extra cost. Each farmer may instruct his servants to keep the surroundings of their huts clean and see that they do so. Rich farmers may construct pucca quarters for their servants on approved modern lines. The Government may encourage this by the granting of loans for the purpose. Money may also be obtained at a reasonable rate of interest on the co-operative basis.

The farmer should also do something to enable his servants to save a portion of his income for the future. We hear of compulsory insurance, old age pensions and the like in European countries, but there are no such arrangements in India. Here, farmers of status may start on behalf of their servants a sort of provident fund to be paid back with interest and an additional bonus depending upon the length of service. One may ask if servants in India can, after providing themselves and their family with food and clothing spare anything to contribute to such fund. If they give up drinking and do not waste money unnecessarily on ceremonials, there is no doubt that some at least will be able to do so. In rare instances servants may also be encouraged to buy small pieces of land with their savings, supplemented by their masters' donations. In an instance a pariah

labourer during his long service of over 25 years was by the encouragement and help of his kind master able to become an owner of about three acres of land. In spite of this rise in his status the servant continued to serve his master more faithfully than ever, cultivating his master's land as well as his own. It is such healthy co-operation in increasing each other's prosperity that is a desideratum in this country, and that has to be brought into existence.

Conclusion.

In the foregoing pages several suggestions have been made for the improvement of the relation between a farmer and his servants. The initiative in giving effect to them is in almost all cases, to be taken by the farmer. The average Indian farmer, as already stated, is himself in a very backward condition and unless his condition is first improved there is little scope for his attempting to improve his servants. Both the farmers and servants therefore are at present largely dependent upon the Government, Zamindars and other rich Mirasdars of whom farmers hold their lands and it is the duty of those to do the needful. I cannot better conclude this essay than by quoting a few words of Lord Selbourne, President of the Board of Agriculture in England, which every one interested in the improvement of agriculture in this country may remember.

"We want to see the agricultural labourer assured of a good wage, a good house and a good garden. More than that we want to see him assured of the prospect of becoming a cultivator himself and eventually an owner. We want in fact an agricultural ladder which will enable a man to rise on the land just as he can rise in any other walk of life. Then we want the farmer to be other than a man who chooses farming because he likes its outdoor life and the sport that is in it. We want all the brains that we can get into agriculture as well as capital. We want men to go into farming. Not because it is a pleasant healthy life but because they can make money out of it. Lastly, we want land-owning to be regarded as luxury but not a business requiring as much study and energy as any other profession."

Systematic and intensive dry cultivation in the West Coast.

The West Coast as is well known, is a hilly country. It was originally almost entirely covered by forest, evidence of which is not lacking at the present day. As the population increased, the people began to destroy the jungle, naturally in the cheapest way and that is by burning it, in order to raise food crops. With the advancement of civilisation the necessities of life continued to increase. Different kinds of crops including industrial crops were one after another brought under cultivation.

At present there are three distinct types of cultivation practised between the ghats and the sea, namely dry land, garden and wet land. A bird's-eye-view of the country would reveal a number of rivers running westward through undulating country, each river bordered on either side by a green strip of land where generally nothing but paddy is grown. These strips would in their turn be bordered by land allotted to permanent crops grown on the woody hill slopes bordering each river valley. These wooded hill slopes would again gradually merge into the shrubby hill tops devoted in part to dry-land rain-fed crops. It is proposed to confine this note to the cultivation of the last named tract which is registered in the settlement registers as "unoccupied dry" known in English and in Malayalam as "അസ്ഥിരം പാല." This land is not permanently under cultivation neither is it assessed as such. The nature of the soil varies in different tracts and mainly for this reason, differences in the systems of cultivation are to be seen in South Malabar, North Malabar and South Canara.

What strikes one most concerning the prevailing system of cultivation on these dry lands is the hap-hazard unprofitable way in which it is being done, resulting in wholesale destruction of

forests. In certain localities leaf manure has now become so scarce that a head load costs from 6 to 8 annas. The chief crops commonly grown are Ginger and Paddy while Sweet potato and Tapioca are becoming increasingly popular. The shortage of jungle leaf for manuring these crops is being felt more and more every year.

In Malabar, the lands are mostly private Jenmum. The Jenmies are absentee land owners and they have no personal interest in the cultivation of their lands provided they receive their share of the income. In South Canara the dry lands are mostly Government lands and excepting in the common "Kumki" and those belonging to the Vargadars, the jungle growth is fast becoming a thing of the past. Mudebidri, Karkal, Puthur and interior of Kundapoor where jungle leaf is available, fairly intensive cultivation of dry land is not uncommon.

The dry land cultivation practices in North Malabar and Kasaragod Taluk of South Canara are typical of the practices throughout these tracts. Here the most general system of dry land cultivation is to cut and burn the jungle once in 3 to 6 years; sow rain-fed paddy in April, May and rake in the seed well immediately before the South-west Monsoon breaks. The yield of paddy varies from 5 to 10 times the quantity of seed sown (seed rate being 30 Madras Measures per acre). This is called "Punam" cultivation in Malabar and "Kumri" cultivation in South Canara. No other crop is grown on these lands for some years, but before scrub jungle has time to re-establish itself, it is again destroyed as before. The roots of trees left unburnt are dug out for the purpose of firewood. As a result we see vast areas of land devoid of any vegetation in the place of thick forest of the olden days. The evil effects of this wasteful and ruinous system of cultivation cannot be over-emphasised, and some of the reasons why the practice should be discontinued are detailed hereunder:—

(a) The soil is laid bare to the full force of the heavy downpours of rain commonly experienced in these parts. The finer particles of soil are washed away leaving a thin sterile soil incapable of growing any kind of crop profitably.

(b) The fertility of wet lands in the valleys underlying these hills is largely dependent on annual supplies of silt washed down. By removing all vegetation, the lands become so bare of surface soil that the silt brought down by the streams will be inadequate to supply the needs of the paddy lands. A deterioration in wet lands attributable to this cause is already being felt.

(c) In the absence of vegetation practically all the rain-water will immediately flow off the land instead of being retarded in its flow so as to provide a continued supply for the low lying paddy lands.

(d) The fertility of the high lying lands is known to have deteriorated to such an extent in some cases that even fodder grasses cannot subsist on them. In such cases it is only such grass as can be used for thatching, will thrive.

But it would be a great mistake to denounce a practice wholesale without suggesting an alternative. What then is the remedy? The answer lies in the adoption of systematic dry land cultivation on rational lines. This is what is being done and is being demonstrated on the Government Agricultural Station at Taliparamba.

When this Farm was taken over by the Department some 10 years ago, the dry lands attached to it, comprising an area of 6 acres was typical of the scrub jungle tracts of the locality. The first process was to fence thoroughly the whole of the estate. This was cheaply and efficiently done by erecting an earthen wall about 7 feet high and 4 feet broad at the base. This is protected from heavy rains by growing a small variety of aloe

along the top of it. The latter also adds to the efficiency of the wall by protecting the enclosed lands against the ravages of straying cattle, wild boars and human depredators. By digging a trench on the outside, this fence in addition serves to protect the dry land, by diverting the overflow of water from higher ground and by acting as a fire-guard.

This dry land is kept regularly and systematically under cultivation year after year. And the system which has proved to be such an unqualified success is here outlined in the hope that others who are interested in such lands might also adopt it.

The area under trial is divided into three equal portions for the reason that the rotation adopted is a three-fold one.

First year—Ginger ; Chillies ; or Turmeric.

Second year—Cereal crop :—Ragi or paddy.

Third year—Green manure crop :—Cowpea etc.,

The advantages of growing crops by rotation are numerous too well known to need repetition here. But the experience gained on the Taliparamba Farm by adopting a definite system of rotation on dry lands is so valuable that it deserves to be made widely known.

In the first year of the rotation Ginger, Chillies and Turmeric are crops which normally give a net profit varying from Rs. 100 to 200 when grown on lands which previously only gave an yield of 150 to 300 Madras Measures of paddy once only in every 3 to 6 years, valued at about Rs. 15 to 30. A note on Ginger has been published in leaf let No. XIII of 1911 which may be obtained free of cost.

In the second year the grain crop—Ragi or dry paddy will profit considerably by the residual effect of manure of the

previous year and 400 to 500 Madras Measures (about 1000 lbs. of paddy may be expected.

In the third year the land is given a rest and a crop is grown with the primary object of returning it to the land so as to enrich the soil preparatory for next year's crop.

In the fourth year the land is again ready to take such heavy yielding and profitable crops as Ginger, Chillies or Turmeric and the rotation is then repeated.

It must not be forgotten, however, that the land must in the first instance be divided into plots approximately equal in area.

	1st year.	2nd year.	3rd year.
First field.	Ginger Chillies or Turmeric.	Cowpea.	Ragi or Paddy.
Second Field.	Ragi or Paddy.	Ginger Chillies or Turmeric.	Cowpea.
Third Field.	Cowpea.	Ragi or Paddy.	Ginger. Chillies or Turmeric.

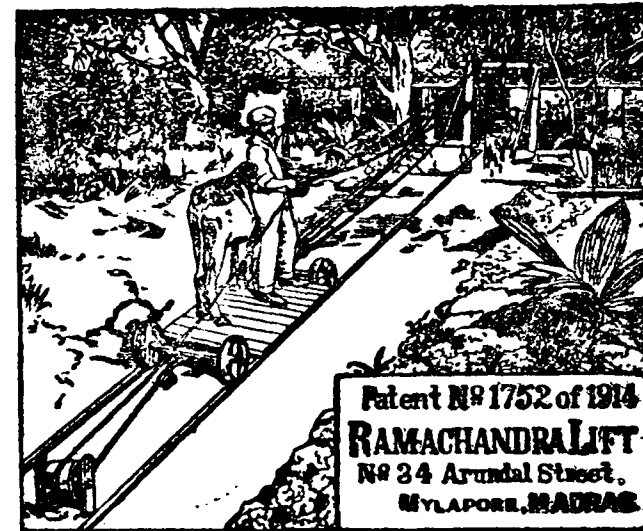
In dividing up the land thus, it must not be forgotten that a fair-sized reserve should be left where permanent jungle is allowed to grow. The worst and steepest land on the estate may be allotted for this purpose. In course of time this jungle should provide ample leaf for manuring the dry lands and ample firewood to meet the needs of the occupant without materially affecting its value. But to do this it is necessary to protect and

guard it as already indicated. The actual area to be cultivated will in each case depend very largely on the size of the estate, but no definite rules can be put down.

It is gratifying to note that as a result of experiment and demonstration on the Taliparamba Agricultural Station and the preaching of the departmental officers, large areas of dry land are already being fenced in for intensive cultivation on the lines indicated above. Many ryots have been benefited by the adoption of this system. In place of the customary extensive, open, uncultivated spaces one cannot fail to notice all over the West Coast and particularly in North Malabar a number of fenced patches where crops are now grown by rotation.

Further details of information concerning the best method of cultivating dry lands on the West Coast may be obtained by a personal inspection of the Government Agricultural Station, Taliparamba, or by writing to the Farm Manager.

M. GOVINDA KIDAVU,
Farm Manager.



Ramachandra Water-lift.

In the above wood-cut showing an illustration of the eastern bucket and rope drawn by the help of the western iron horse is an example of the east and west working together for the common good of India, where water-lifting is the greatest problem of the day.

In tracing the history of the water-lift in India the first inventor was the one that invented the palmyra leaf bucket that is now used in the Tinnevely and the Godavari Districts. The next inventor was the man that stripped the bark of the tree and used it as a rope. Leaving aside the various inventors that made the wooden, leather, and metallic buckets, pulleys &c., we come to the greatest and most ingenious of our ancients namely, those that used the live-weight of men and animals on a see-saw and on inclines. Our Piccottah and the country Kavalai are the only two water-lifts that stood the test of time. It is therefore evident

that all other attempts to invent water-lifts without utilising our ancient method of applying the animal power have all proved futile. The Piccottah is the simplest, cheapest and the most efficient. The weight of the moving parts of the machine (i. e.) the wooden see-saw bucket etc. is not more than three hundred or four hundred pounds. And the friction is therefore very low. But it has its own defects. First, it cannot be safely used for depths more than twenty feet. Secondly the number of men required to lift a large bucket with this lift is too very great, that it not only becomes very costly but also difficult to procure during the cultivating season. Thirdly one man is entirely wasted in guiding the bucket. Thus Piccottah cannot be an universal lift. The country Kavalai is only universal for want of another better, and it is so unpopular that people call it *கவலை* (anxiety). It has a costly and troublesome water bucket though very ingenious. It costs a great strain on the animals that they very soon deteriorate. It was in view of solving this difficulty, that one of the greatest, and oldest of our Madras Agricultural College Students nearly a quarter of century ago struggled hard for years to substitute the live-weight of animals on a see-saw in place of men over a Piccottah. He did succeed in making a wonderful machine. But still it had two great defects. Firstly, it was found not safe to work to great depths with a long wooden platform that carry heavy weight of animals. Secondly, the weight of such a moving cattle platform was over three hundred pounds. Though the platform was carefully balanced on an axle still the friction of the moving parts was so great that it absorbed enormous power. Though this great intellect, Rao Bahadur C. K. Subba Rao, did not succeed in making a popular lift, yet he did go a great step in water-lift inventing, leaving his students to proceed further. Many did know that he lost his life and all that he earned in his life, in this noble enterprise for the sake of the ryot population. With the inspiration of this great personage at whose feet I had the honour

and privilege of sitting for education and enlightenment, I am trying to carry out his idea a step further by removing the two defects in his ingenious machine. Unlike Mr. Subba Rao, I took the permanent incline over which our country Kavalai is worked for utilising the maximum effect of the live weight of animals. Thus the difficulty of lifting water from any depth is solved. Secondly, the weight of the moving parts of the machine such as the trolley, bucket, and the ropes etc. is reduced to such a low figure as 60 to 120 pounds. So much so, that it is even lighter than the see-saw of a bamboo Piccottah. As for the friction I have given four cast iron wheels to the four legs of the animal, and made it skate down a railed incline, thus avoiding the pulling and backing action of the animal which costs a great strain and deterioration in their health. And the water bucket too has been made the simplest and the cheapest having the minimum wear and tear.

In making this machine, every care has been taken to avoid any of the troublesome parts of other machines such as toothed wheels valves, springs, hinges, washers, plugs, closed pipes, foot-valves, water joint, etc.

Owing to the low friction in the moving parts, the cost of ropes required per year is not more than one rupee. After one month working this machine has been found to work very smoothly lifting not less than hundred buckets per hour from an average depth of 20 ft. at the rate of three gallons for every hundred pounds live-weight or in other words a hundred pound animal easily lifts three hundred gallons per hour, while in a Kavalai a hundred pounds weight of an animal does not lift more than hundred to hundred and twenty gallons per hour, thus one old animal easily does the work of three young animals. Every one that is using this machine in different parts of the Presidency says that their animals have improved in condition so much so that they want bigger buckets. Dr. Nanjunda Rao of Madras

says that he is now irrigating two hundred and fifty mango plants over four and half acres in about two hours time with an eighteen gallon bucket and an old animal weighing five-hundred pounds, for the last seven months. In another two hours time, half an acre of ragi crop is easily irrigated by the same lift. This machine is superior to a piccottah also. A man and a small *rekla* bull weighing about three hundred pounds can easily lift 1200 gallons per hour while three men on a Piccottah are not able to lift more than 1000 gallons per hour. The cost for maintaining a man and a small bull is certainly much cheaper than that of three men. The lift in the Central Farm Coimbatore has a water bucket of twenty gallon capacity and the animal that worked it weighed about six-hundred and fifty pounds. The animal was estimated to cost about forty rupees as it is very old. On the 2nd day of the trial, the animal was able to lift sixty buckets of twenty gallon capacity per hour. After a month's use the machine will easily work hundred buckets or two-thousand gallons per hour. The gradient of the incline is 1:3.5 while Mr. Chatterton C. I. E. in his bulletin No. 35 of 1912 says that even 1:3 is a good slope for animals to walk up. In Bellary a gradient of 1:2.5 is given to Kavalai animals. Thus in every way this machine must be efficient and very cheap.

The energy of an animal is directly proportional to its weight under similar conditions of climate, feeding and previous training. It is possible to train a small bull to do more work than its weight can do. But this is irrational, unscientific and cruel. The best way to judge of the capacity of an animal to work is to work it in its natural form and then to observe how it feels the strain on his muscles in working the machine. In the Live Weight Trolley Lift one animal can easily do more work than that of two animals without breathing hard, or frothing.

In judging the merit of the machine by its efficiency, I calculate as follows:—

Energy spent:—

700 lbs. weight of animal walking up a gradient of 1:3.5 over 20 feet length-height to which water is lifted.
i. e. $700 \times 20/3.5$ equal to 4000 foot pounds.

Work turned out:—

20 gallons of water lifted to 20 ft. height.
Or 200 pound lifted to 20 ft. height.
i. e. 22×20 or 4000 foot pounds.

Here the work of the driver is not calculated as was done by Mr. Chatterton C. I. E. in his bulletin No. 35 of 1912 on Water-lifts.

The efficiency of Kavalai as per above bulletin is 33%. The above calculations will speak for themselves.

S. RAMACHANDRA IYER.

Notes.

Prickly-Pear for fodder purposes:—An interesting machine called the "B and H Pear-burner," obtained from Texas U. S. A., is now under trial by the Department of Agriculture, Bombay. It consists of a 2 gallon vessel to which is fixed an air pump and from which a metal lance tube leads to a vaporizer 4 feet away. The tank is filled two-thirds with petrol and the air is pumped in. A strong flame easily adjustable and capable of being turned in all directions is obtained at the vaporizer end and this easily burns off the spines. The next thing is to teach cattle to feed on such treated bushes. The machine costs Rs. 68—2—0 landed in Poona. The cost of working is not yet known. T. S. V.

Destruction of field Rats:—Mr. Jhaveri of the Bombay Agricultural Department is said to have successfully used the "White-Ant Exterminator" for the purpose of killing field rats in their

excavations. Sulphurarsenic fumes are produced inside the machine and are pumped into the rat-hole. Some 60 to 80 distinct rat excavations can be dealt with in a day, by a party of 2 or 3 coolies and one machine, at an aggregate cost of less than one rupee. When there are several holes or entrances leading to the same excavation, only one fumigation is necessary as the rest can be blocked up with earth.

In Coimbatore *Oddars* do smoke rat-holes in the above manner, but they use a small mud pot with a hole on one side. The pot is filled with some material such as cow-dung cake and a smouldering fire is kept up. The hole is then applied to the rat excavation and the smoke is then blown in, after previously blocking up all other holes with wet mud. The rats either die in the holes or escape in a half-stupified condition, when they are easily killed. T. S. V.

Sex in the Papaya plant:—Our readers are probably aware that the Papaya bears either male flowers alone or female flowers alone. Mr. L. B. Kulkarni of the Bombay Department of Agriculture has made the interesting discovery that some trees change their sex as they grow. T. S. V.

Another use for the "Tulasi" plant:—Mr. Rama Rao Kasargode L. Ag., lecturer in Entomology Poona, has discovered that a distillate of the Tulasi plant is peculiarly attractive to the males of the mango fruit-fly and can be used as a bait to lure them to fly-papers and traps. T. S. V.

India's possibilities in sugar-production:—"If the Indian Empire produced 800,000 tons of white sugar that she at present imports, plus another 500,000 tons to send to the United Kingdom. She would be £ 26,000,000 a year richer at £ 20 a ton, and half as much again if calculated on a basis of £ 30 a ton; and to do this she has only to produce 2 tons of white sugar per acre

as compared with over 4 tons per acre, the average return in Java." *Agricultural News July 1st 1916*. What a big "If"—

K. K. Rao.

The Stethoscope:—It was just a century ago that Laennec, a physician of Paris, invented the *stethoscope*. In the year 1816, he was consulted by a patient who had apparently symptoms of heart disease and in whose case percussion was of no use owing to the patient's obesity. Remembering the simple acoustic fact that the impression of a sound is conveyed through solid bodies, he rolled a quire of paper into a cylinder and applied one end of it to the heart and his ear to the other end, when he found that the action of the heart was more clearly and distinctly audible. Such was the origin of "the listening tube of Laennec" which had its critics for several years and was considered a toy. The real fact is that the simplicity of the discovery and its overwhelming usefulness concealed its greatness. No medical man, Veterinary practitioner included, can afford to be without it now.—*From the Pharmaceutical Journal. (M. B. B.)*

Estate Notes.

Officers' Club Anniversary:—Advantage was taken of three consecutive holidays for the celebration of the second Club-day in commemoration of the opening day of the new building. Tournaments in Tennis, Badminton, Ping-pong and Cards (Bridge & "304") were started. Members joining the tournaments had to pay entrance fees for the various items, which were utilised for providing prizes to the winners. As the ~~tees~~ were arranged by drawing lots, much fun was witnessed during the course of the tournaments. On the night of the 20th Mr. C. Narayana Ayyar entertained all the members of the club at a dinner arranged at the premises of the Officers' club. On the 21st the finals of the various tournaments were played; at 10 A. M. on the same day a

long procession of cyclist-members marched over to Chettipalayam and back. The club building was tastefully decorated with ferns and flowers. Group-photos were taken of the members, and the children of the estate were entertained at Tea. At about 4 P. M. Dr. and Mrs. Harrison, Dr. and Mrs. Barber, Mr. and Mrs. Mac Rae and Mr. Wood, our Principal, kindly responded to our invitation and partook of tea and refreshments. Mrs. Barber kindly presented the prizes to the winners in the tournaments. Some entertainment was provided in the shape of music and mimicry. On the whole the *Club-day* proved to be a notable success.

Games.

Foot-ball.—A friendly foot-ball match was played in our grounds between the Stanes High School and our team. The match was well-contested and a few alterations of players in the team kept the game steady. The opponents tested our goal with all their might, but the backs proved invincible barriers. The combination of our forwards was not steady during the first half, however in the second half they fared better and put in a goal. Thus the match ended in a win for the A. C. & R. I.

Hockey.—A return match at Hockey was played in our grounds between the teams representing the Coimbatore Reserve Police and the A. C. & R. I. The play from the bully off was more favourable to the opponents who came like torrents. Before the play was brought to a close the Reserve Police were left the winners of the day by three goals to one.

Hockey. A third match at Hockey was played with the Reserve Police. From the bully off our forwards had a very good combination and they were visiting their opponents' goal very often. The opponents' forward tried their best. A change made in our team especially in defence equalised matters for the time. Our forwards had a beautiful pass and to their credit they put in 3 goals.

Departmental Notes.

1. E. K. Kunhappa Nambiyar for training in office work, Central Farm.
2. M. A. Balakrishna Ayyar:
To continue to work as Sub-Assistant in Botany until return of K. Ramanujachari from leave and then posted to Mangunallur for training.
3. C. Arulanandam Pillai:
To Palur for training in office work.
4. A. K. Ganesha Ayyar:
To Koilpatti for training.
5. Leave.—M. R. Ry. T. V. Rajagopalachari, Farm Manager, Hegari, has been granted privilege leave for 23 days from 8th September 1916.

(v)

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THE JOURNAL

OF

The Madras Agricultural Students' Union.

Vol. IV.

October 1916.

No. 10.

*N. B:—Contributors are requested to send in their contributions
written legibly in ink on one side of the paper only.—Editor.*

Editorial Notes.

On the 23rd of October 1916 the Agricultural College
and Research Institute had the privilege of welcoming His
Excellency Lord Pentland into the estate. The
great interest which our Governor has been
taking in the progress of agriculture in the
Presidency is evident from his setting apart practically a
whole day both morning and evening for the visit.

His Excellency motored to the Farmyard at about
7-30 A. M. when he was received by the Director of Agri-
culture and the Principal. He inspected the various agri-
cultural implements both indigenous and foreign and saw
some of the students working at the winnowing and thresh-
ing machines. After being shown round the Veterinary
Hospital by Mr. Wilson, the Veterinary Assistant, His

H. E. The
Governor's
visit.

Excellency inspected the cattle stalls where besides the famous Kangayams he saw some Jersey cows reputed to be good milkers and a fine specimen of the Delhi buffalo. The stud bulls of the Farm—both of foreign and local origin—and a fine set of calves obtained by crossing the 2 breeds *inter-se* next attracted his attention. Here His Excellency took a few snapshots and thence proceeded to the Dairy which was shown round by Mr. Ananda Rao, the Assistant Principal of the College. Here His Excellency made enquiries regarding the sales of butter and the sort of training the students get in the Dairy.

Some of the fields of the Farm—including a field of Cambodia cotton where bullock-hoeing was in progress—were next visited. The officers' club had here put up a triumphal arch of welcome to His Excellency. After visiting the co-operative stores which were opened on the estate about 6 years ago for the convenience of the residents, he proceeded to the Botanic garden which was shown round by Mr. Parnell, the Government Economic Botanist. From there His Excellency drove to the residence of Mr. Cumming, the Collector of Coimbatore.

In the afternoon His Excellency arrived at the College a little after 3 P. M. and was received at the portico by the Director, the Principal and the gazetted officers of the College. After inspecting the College Museum, he passed on to the research laboratory of the Government Agricultural Chemist where Dr. W. H. Harrison explained to him the various lines of work now in progress, such as, soil surveys of various districts, and analyses of well and irrigation waters and

manures. In the Teaching Chemical Laboratory he saw the students conducting some interesting experiments on the water holding capacity of the different kinds of soils, and the relative capillarity of different kinds of soils under the guidance of M. R. Ry., M. R. Ramaswami Sivan Avl., the Senior assistant to the Agricultural Chemist. He then proceeded to the section under the control of Dr. C. A. Barber, the Government Sugarcane Expert and was shown here actual specimens, paintings and photographs of North Indian and South Indian canes. Suitable exhibits were put up to demonstrate the various stages in the raising of sugarcane seedlings and some of the actual achievements of the Sugarcane Breeding Station. The next section to be visited was that of Mr. Parnell, the Government Economic Botanist, who is engaged in Mendelian work on two of the most important crops of the Presidency viz., paddy and cotton. The laboratory of Mr. Mac Rae, the Government Mycologist was next visited and here His Excellency saw various exhibits to demonstrate the life histories of some of the main fungus diseases of the Presidency, such as that of the areca-nut, the cocoanut, the palmyra and rubber. From thence he proceeded to the section of M. R. Ry. Rai Bahadur K. Rangachariar Avl., the Government Lecturing Botanist and the author of a standard Text-book on Botany, and the Governor expressed keen interest in the new work on Agricultural Botany which is now in the making. At the laboratory of the Government Entomologist under M. R. Ry. T. V. Ramakrishna Iyer Avl., His Excellency saw the various kinds of insects according to their general and economic importance. His Excellency then adjourned to the general lecture room to have Tea which had been

arranged by Mr. R. C. Wood, the Principal, helped by the European ladies on the Estate. Besides His Excellency and party there were present at this function all the gazetted officers of the college, Mr. Steel, Mr. Howley and Mr. Hart.

After inspecting some of the rooms in the students' hostel His Excellency proceeded to the maidan to lay the foundation stone of the Pavilion. En-route the M. A. S. Union had put up a triumphal arch welcoming His Excellency.

Mr. G. A. D. Stuart, the Director of Agriculture, in requesting His Excellency to lay the foundation stone of the pavilion said that it was to be a combined sporting pavilion, the students' reading room and the hostel manager's office. He further observed that the students, in a true sporting spirit had taken the contract of the building and by working with their own hands hoped to raise a much larger building than would be ordinarily possible for the sanctioned amount of Rs. 2500. He added that incidentally the students would gain much valuable experience in carpentry, masonry and house building. Amidst loud applause His Excellency declared *the stone well and truly laid* and said that he hoped that the building would give shelter and comfort to many generations of sporting Madras Agricultural College Students. His Excellency left the Estate about 6 P. M. amidst loud cheers.

We invite the attention of the members of the Union to the 2 prize essays, the details of which will be found in the first two pages of this issue. Such prizes are instituted

with the object of stimulating thought on questions of paramount importance to the agriculturist. Incidentally they also yield a certain amount of matter for the journal. We have heard it said that the offer is too inadequate for the valuable information the competitors are expected to part with. We strongly deprecate viewing this as a piece of commercial transaction. On the other hand the competitors are expected to enter the lists in the spirit of the good Knight Templars of old—loving the fight for the sake of fighting. Others have said that the fear of risking their reputation keeps many a member from the competition. We may here mention that the executive of the Union is bound to absolute secrecy and the essayists are known only by the *nom-de-plumes*. We are induced to make these remarks by the very small number of competitors in the previous years, a fact which has made many a donor doubt the usefulness of such prizes.

The working committee of the Union has resolved to present contributors of *original* articles with 12 copies of the journal or 12 copies of their articles. We are frequently running short of matter and we appeal to all the members of the Union to do their little bit for this little journal of ours.

We congratulate M. E. Couchman Esq., I. C. S. our former Director on his elevation to the Board of Revenue as 4th member Land Revenue Department. He is continuing to take a keen interest in our department and its activities, and we wish him all success in his new career.

The Prize
Essays.

Contributions
to the
Journal.

The Hon'ble
Mr. M. E.
Couchman.

We have received the first copy of 'The Peradeniyan' just started at the Tropical School of Agriculture, Peradeniya, Ceylon. It is to be a half-yearly journal to be published on 1st October and 1st March and is priced at Rs. 3/- a year. The object of the journal is to chronicle the doings of the school of Tropical Agriculture and of the students of the school past and present. The school itself is a unique one and its doings should certainly be interesting. We are told that it is not to be an agricultural journal and subjects of a purely technical nature will not be given undue prominence. Space will be provided for matters of general interest and of a lighter vein. This journal resembles our own in some respects and we give it a very hearty welcome.

We are very sorry to find that owing to an oversight, we forgot to make mention in the leading article of the conference number of our Journal, of the fact that during the College Day an announcement was made of a donation of Rs. 100/- by the Zemindar of Parlakimidi, for the institution of a cup to be presented to the best athlete of the College for 3 or 4 consecutive years. We owe the Zemindar an apology for this omission.

D'Silva Memorial Fund.

At a meeting of some of the old students of Mr. D'Silva resident on the College Estate held on 6th October 1916 and presided over by Mr. Ananda Rao it was resolved,

(a) that the Working Committee of the Madras Agricultural Students' Union, in collaboration with the following old students, residing in the mofussil (Messrs. Vengail K. Krishnan Nayanar, T. N. Virarayan Thirumalpad, P. Kochu Kunjuni Achan, Rai Sahib A. Sethurama Ayyar, G. Jogi Raju and Badami Siva Rao) be requested to take steps to start a Memorial to perpetuate the services rendered to the Agricultural College by Mr. S. L. D'Silva.

(b) that Mr. Vengail Krishnan Nayanar be the President of the Committee and Messrs. T. N. V. Thirumalpad and K. Raghavachari (Joint Secretary, Madras Agricultural Students' Union) be joint secretaries.

(c) that the balance of Rs. 25 being the surplus from the send off collections be handed over to the Memorial Fund.

(d) that it is desired that a portrait of Mr. D'Silva should be hung in the College Hall and a prize in Veterinary Science be awarded at the College.

Old students of Mr. D'Silva, his friends and admirers are requested to subscribe towards the Memorial. Remittances may be sent to Mr. K. Raghavachari, L. Ag., Agricultural College, Lawley Road, P. O. Coimbatore or to the District Urban Back, Coimbatore, to the credit of D'Silva Memorial Fund. Contributions will be acknowledged by the grant of a receipt and also in the issues of the Journal of the Madras Agricultural Students' Union.

The precise forms which the Memorial should take can be determined only after knowing how much money is collected. Remittances are therefore requested to be sent early.

Subscriptions for D'Silva Memorial Fund.

I. List.

1.	Surplus from send off entertainment to Mr. D'Silva—Through Mr. M. R. R. Sivan	...	25—0—0
2.	Mr. Vengail Krishnan Nayanar	...	30—0—0
3.	„ T. N. Veerarayan, Fourth Tirumalpad of Nilambur	... ..	30—0—0

4.	„	R. C. Wood ...	...	...	15—0—0
5.	„	Rai Sahib A. Seturama Aiyar, Needamangalam...	...	...	15—0—0
6.	„	P. K. Atchen, Adoor Cochin	...	...	15—0—0
7.	„	Ananda Rao ...	...	...	10—0—0
8.	„	G. Jogi Raju	...	...	10—0—0
9.	„	M. R. Ramasami Sivan ...	...	...	5—0—0
10.	„	T. S. Venkataraman	...	...	5—0—0

Students' Tour, I:—in the Districts of Coimbatore and N. Arcot.

During the last week of August, the Assistant Principal took the Second Year Students on tour. On this occasion, the students spent a week in camp visiting Erode, Tirupathur and Vaniambady. At Erode, the Assistant Director of Agriculture, Southern Division with his assistant met the touring party and took it round Erode and Unjalur. The students observed the intensive wet cultivation that is in practice around Erode and made detailed enquiries regarding plantain and turmeric cultivation for which Erode is noted. The importance of the Bhavani River to the Coimbatore District was brought home to the minds of the students and the methods of farming of the greedy ryots in taking three successive paddy crops in a year in certain plots of their holdings protected by the Kalingarayan Channel were most interesting. On account of the intensive wet cultivation ryots have to spend much money and energy in getting green leaves, especially Kolingi, from far off places, and the great necessity of the introduction of green manure crops into that locality was forcibly brought home to the minds of the students. To their pleasant surprise, they found at Unjalur about 20 miles from Erode, an excellent crop of Bengal daincha grown by one, Mr. Subramania Ayyar in accordance with the advice of the Agricultural Department. No doubt the crop at present is only a matter of curiosity to the neighbouring ryots, and the department may have to devote much of its time and energy to its extension before it receives the universal acceptance of the ryots of that locality.

The touring party left Erode after taking leave of the Assistant Director for Tirupathur. This place once belonged to the Salem District, but now forms part of the North Arcot District. On the evening of the 23rd August, students visited Vengalapuram a village about a mile from Tirupathur and made detailed enquiries regarding dry land farming of the locality. They saw crops of ragi, cumbu, varagu, samai, groundnut, red gram and cowpea. Next morning the students went to Damalarimuthoor, a village 3 miles to the north of Tirupathur town and a mile from the foot of the Yellamalai Hills. Here the students spent their time in enquiring about the cultivation of single cropped wet lands protected by rainfed tanks. Detailed enquiries were made about the sugarcane crop of the locality and the students saw the wrapping operation of the crop of which they had heard in their lecture rooms. In the afternoon the party visited Parandapally along the Krishnagiri line to see grape vine cultivation. Students took much interest in learning about its cultivation and valuable information regarding root and shoot pruning was collected. When returning to Tirupathur, the students were fortunate enough to meet their old teacher, M. R. Ry. R. Ramaswami Ayyar Avl, at the Railway Station. Next morning the party in company with Mr. Ayyar visited an oil factory and also observed a chain-pump lifting water in a neighbouring village. In the afternoon the party left Tirupathur for Vaniambady, another important place in the North Arcot District. When a big party moves from place to place, getting suitable accommodation is always a matter for anxiety. Vaniambadi being entirely a Muhammadan town the party would have been put to much inconvenience had it not been for the kindness of Mr. Mahamad Ibrahim Qurashi, the Head Master of the Mahamadan High School at Vaniambady. When the party was moving in search of a suitable resting place, Mr. Qurashi warmly welcomed the party to his newly erected school Hostel and made all necessary arrangements for the convenience of the party. Vaniambady is a beautiful town and a stronghold of the Mussalmans of the Labbai class. There is a private Mahamadan High School which Mr. Qurashi wants to convert into a Second Grade College. Mr. Qurashi is a man of a quiet exterior with a burning enthusiasm for the uplift of that community. It is a matter for gra-

tification, that Mr. Manikam an ex-student of our College is working in this institution as an agricultural instructor and before long the school authorities intend to attach a small farm to that institution. Let us hope Mr. Manikam will prove worthy of his *Alma mater* in imparting the knowledge which he has gained in the Agricultural College. In taking leave of Mr. Qurashi and his band of workers, we wished them every success in their mission.

Next morning the students were taken to Periapettai, a village in the suburb of Vaniambady. This is a wet area irrigated by spring channels from the Palar river. This river with its branches almost surrounds Vaniambady and its neighbouring villages. Beautiful cocoanut topes are seen along the banks of the Palar and remind one of the palmy groves of the West Coast. Students made detailed enquiries regarding paddy, sugarcane and betel vine cultivation. Tannery refuse forms an important source of manure here, as there is a large trade in hides at Vaniambadi. Excellent crops of sugarcane and betel vine are cultivated by Mohammadan ryots. It was very pleasing to meet here, a Mohammadan ryot of liberal views who explained the local cultivation of sugarcane in detail and wanted new varieties of canes yielding higher percentage of jaggery and was much interested in learning about jaggery making at the College Farm. He promised to visit the Farm during the season. This Mohammadan is not only a cultivator but also a merchant who had been out of his village several times to distant places such as Rangoon, and who had come in contact with ryots of several places. This is the main reason why he is so liberal in his views and so different from his brother ryots whose knowledge of the world does not go beyond the limits of their villages. If travelling had such a marvellous effect on the attitude and knowledge of that Mohammadan ryot, what must be the educative value of the Agricultural tours on the students. Mr. Vellodi a brother of one of our ex-students and the Deputy Tahsildar of the place was of great help to us in our stay at Vaniambady. Next day the party returned to Coimbatore from Vaniambady.

Students' Tour, II:—A tour to Kollengode, Malabar.

The students of class II were extremely fortunate in accepting the invitation extended by the Rajah of Kollengode, to make that place the object of a tour. The country is extremely attractive and the tour proved most instructive, while, the Rajah was kindness and hospitality itself. We assembled at Palghat—in itself a most interesting town with a very well preserved fort, where we were lodged in a part of the Hostel attached to the Victoria Institute. We noticed our Principal, with interest in such matters, inspecting this in the evening, and certainly the standard of these quarters is high. The rooms are arranged round a quadrangle which with the good rainfall that this town enjoys, was kept pleasantly green and fresh. Kitchens and dining rooms are located in the rear of this block while on the front side over the porch are rooms for the Warden, who sleeps there regularly a few nights a week. A newly constructed Reading Room excited no envy in view of our own approaching one, though the piece of glass stuck in the doorway of each hostel does not ensure the privacy we enjoy at Coimbatore. Next morning we all journeyed to Kollengode. Our Principal was taken by the Rajah in his car, but this necessitated a rather longer detour, than was necessary for the juktas which were able to cross an unbridged river. On arrival at Kollengode we found ample and comfortable accommodation which we did not enjoy long, as we were at once taken out round the fields near. The details of such a walk are known to most, and I need not dwell on them here. The straggling party of students, divided into batches to permit of the interpretation which is always needed, and the continual urging of the Principal which is necessary to keep the party at all on the move. Next day we went towards the hills and after a long and hot walk we were delighted to come across a charming bathing pool where we were

- kindly permitted to bathe, though curiously all did not avail themselves of this splendid opportunity. We returned next day to Palghat and left for Coimbatore by the afternoon train.

The interest of the tour to those who did not know the Malabar Coast lay in the discovery of unirrigated paddy, that is to say, which was grown solely with the rainfall. We were led to ask whether if this was the case, still more valuable crops could not be grown, and we learnt that though this was undoubtedly so the practice was not generally followed. Another interesting fact was the extraordinarily rapid change we were able to see in moving along east of Kollengode towards Pollachi. This was primarily of course due to the rainfall, but affected the cropping, the climate, the scenery, and the people. The few Tamil villages seen certainly did not compare with the Malayalam ones, but we learnt that for the dry cropping that becomes unimportant on the border line of the district, the Tamil-Goundan was the better man.

We saw much else of interest, and much that was novel, and it was a thoughtful and kindly idea that prompted the Rajah to prepare for us a little booklet describing the agriculture of the *Venganad* with which our thirst for knowledge could be partially slaked. The pertinent and searching questions at the end displayed the keen interest which the Rajah has in his tenants and their welfare. We offer our hearty thanks to the Rajah for this and for his other kindnesses, and to our Principal who took us there.

Sugarcane crop, its past, present and future in relation to Noyyal valley.

Sugar is becoming of late a necessary article of food in India. It is being used either in a refined form or in the form of jaggery in

many a preparation; foods, drinks and sweetmeats in every household. The days when its use was more or less a luxury and a dainty belong to the past. The increased consumption of the article is evidenced by the steadily increasing imports of sugar from foreign countries, the local production being unable to meet the demand in full. It would seem a paradox that India which is one of the largest sugarcane producing countries in the world, is obliged to import such a large quantity of sugar as 600,000 tons-the causes are not far to seek. A large portion of the Indian population is becoming more and more accustomed to the use of sugar in a refined form. The jaggery produced in India, owing to its impure and crude state is going out of favour. The influx of cheap sugars from foreign countries partially controls the price of jaggery as well as its production. The area under sugarcane is consequently in the downward movement. Statisticians say that the prices of jaggery have not risen in the past 20 or 25 years in the same proportion as the prices of food crops and cotton. The question of the future of the sugarcane crop therefore becomes one of great economic importance. The past, present and future of sugarcane crop in relation to Singanallur and its neighbouring sugarcane villages as representative of the sugarcane crop in the Noyyal valley, will be dealt with in the succeeding pages; while doing so, reference to the Sugarcane crop of India as a whole, is found necessary, as the future of the crop of any particular tract is closely bound up with the future of the sugarcane crop of India.

Origin of sugarcane. Sugarcane is known in India from time immemorial. Many travellers also who had visited India in earlier times make mention of it as seen by them for the first time in India. The existence of sanskrit equivalents (Ikshu-sugarcane, Sharkara-sugar) for sugar and sugarcane, and mention said to be made of it in, 'Mahabharata' show that the plant is of great antiquity. In 86 A. D. an Indian king is said to have sent sugar as tribute to China. In the 7th century a Chinese Emperor is said to have sent his man to Bihar to learn sugar making. By long and repeated cultivation, sugarcane which must have been once a reed, has produced numerous

varieties, some thin some thick. An eminent authority on sugarcane, traces the original parentage of that plant to *Saccharum spontaneum*. The sugarcane plant belongs to the grass order and has roots which do not penetrate into the soil to any depth. Hence its liability to lodging on disturbance. Some varieties of cane flower in hot climates, but most of the seeds are infertile. None believed till recently that sugarcane seed would germinate and produce plants, until it was shown that it does, at Barbados. This discovery is now made use of by Botanists to produce more profitable varieties. Sugarcane is propagated only vegetatively for a crop on a field scale. This is why most of its seeds are infertile.

Climate. Sugarcane thrives well in warm climates and does best in places whose mean temperature is about 77° F. The range of its cultivation is wide. India answers well both the conditions of proximity to the Equator and mean temperature necessary for its most successful cultivation, but has not the natural advantage of requisite and well-distributed rainfall as in Java. In the latter place, the rainfall is 70 inches distributed over 9 months in the year. Irrigation therefore plays a very important part in the cultivation of sugarcane in this country as in many districts the rainfall falls far short of the above named quantity and is defective in distribution.

Soils. Sugarcane can be cultivated in any description of soil of fair depth provided it is a well-drained soil. It is found cultivated successfully in black clay soils of the Godavari Delta, clay loams of the Nagaram delta, sandy loams of Ganjam, black loams of Coimbatore, red loams of Vizag; and in similar or intermediate soils in many other parts of the Presidency. The one condition essential for this crop is fair to good drainage. Stagnation of water in soil is fatal to it. The soils in the Noyyal valley which are clay loams with fairly good drainage produce heavy crops of sugarcane. The cultivation of this crop in light soils is more expensive because they will require more irrigations and more manuring and in loamy soils more profitable owing to the more retentive nature of the soil both in respect of moisture and plant food. The former are capable of improvement by

repeated addition of organic matter in the shape of green manure and of tank silt. Organic matter improves the soil both in fertility and texture. The general practice of applying kolingi leaf to sugarcane crops year after year in Suler, Singanallur, and other villages has in the long course of time materially improved the soils in organic matter—which circumstance helps the ryots to take heavy crops of sugarcane out of the land, even if manuring be defective.

Preparation of land. The land is ploughed length and crosswise about 8 times at intervals of about a week between the ploughings. The number of ploughings is reduced by one or two by poorer ryots. Tradition prescribes sheep folding at 10,000 sheep per acre. This practice was the rule in the past but is now only an exception. Very few ryots in wet lands have recourse to sheep penning at present because there is more land and less sheep. The remuneration demanded by the sheep owners, which was only Rs. 25 in the past is at present Rs. 50 per 10,000 sheep. Silt carting was being much resorted to in the past but to a less extent at the present time. In most cases of wet land sugarcane, in Singanallur and Suler, there is practically no preliminary manuring. But in garden lands, sheep penning is invariably resorted to as a preliminary manuring for the sugarcane crop.

Planting. The planting is done in *Adi pattam* (July—August) in the wet lands. The setts are planted on either side of the ridges previously made for the purpose. The ridges will be 1½' to 1¾' wide and the adjacent furrow will be ¾' wide—so the distances between rows will be ¾' and 1½' alternating. The planting in the garden soils will be done in *Masi* i.e., February—March. In the wet lands, planting is done in July—August because it is then the tanks get filled. The seed rate is at present 30,000 setts per acre and was in the past i.e., about 10 or 15 years ago, only 20,000 sets. The ryots state as their experience that closer planting is attended with better outturn. The material used for seed is cuttings from whole cane for wet lands and mostly tops in garden lands. Although the ryots know the economy of planting tops, the wet land ryot cannot do it because (1) the period of growth of sugarcane crop in wet lands is about 13 to 14 months—consequently the harvesting and planting seasons are not

simultaneous. The use of tops for seed is therefore out of question in this case. (2) the ryots think that tops if planted in wet land soils, get spoiled owing to the over saturated condition of the land. The planting of tops in place of cuttings of ripe cane wherever possible is good in the interest of economy. Ryots pay nearly 35 to 40 rupees for cane cuttings required for planting an acre. If tops which are not useful in any other way be used for planting, the expenditure on cane sets will be saved. Now as it is, the tops or the major portion of them find their way into the cane crushing mill and the resultant juice will be more impure (with more glucose). When tops are cut for planting, only ripe portions of canes will have to be utilised for milling and a better jaggery will be produced. In most parts of this presidency the use of setts from whole ripe canes is the usual practice. But the use of tops for seed is also well known to, and practiced by ryots in parts of Godavari, South Canara, Kurnool and Anantapur districts. Some ryots seem to be under the impression that sets from whole canes produce a better crop and more tillering and that tops though they germinate well give rise to a poorer crop. This impression or rather the belief among some ryots, is simply imaginary and groundless. The results of elaborate experiments conducted at the Louisiana Sugar Station over a series of years, by planting tops, middles and butts in comparative plots are sufficiently emphatic in declaring that crop from tops is in no way inferior to, if not better than crops raised from cuttings. (3) *The above facts therefore urge the desirability of the use of tops for planting wherever that is possible.

Preparation of sets for planting. In the sugarcane villages of the Noyyal valley, the practice of preparing sets before planting is entirely absent and is unknown. In some places in South Canara and Ganjam districts, cane sets are steeped for 12 or 24 hours in water before planting. The object of steeping seems to be to reduce sugar in sets. Presence of sugar in sets sometimes causes the planted setts to ferment and often attracts white ants. These evils are to a large extent minimised by steeping. In Taliparamba the cane sets are dipped in cow dung water and then arranged in loose heaps on a raised bamboo

*Dr. Stubbs on Sugarcane.

platform, covered with a layer of paddy straw and hand watered daily to keep the sets moist. In about a fortnight the germinated sets will be ready for planting. By this method, irrigation which will be necessary for about a fortnight will be saved, and better attention could be paid to sets during their germination. Where planting has to be done in summer, the plan is worth adopting. In the South Canara district the tops are allowed to wilt for about a week and then tied into bundles and steeped in water for a day. The bundles are then removed, placed under shade, covered with straw and handwatered morning and evening for a week or two. The field would be made ready to receive sets by that time.

Number of sets per acre. The quantity of sets used per acre varies in different localities. The cultural experiments made in Samalkot in 1907-08 and the seed rate experiment made in Central Farm Coimbatore in 1912-13 show in favour of closer planting. The large variations in quantity of seed used can be seen from the following figures.

Sets used per acre.		
Ganjam	...	36,000
Vizag	...	25,000
Godavari	...	25,000
Kurnool	...	15,000
Cuddapah	...	12,300
Bellary	...	8,000
South Canara	...	12 to 20 thousands
Singanallur (Coimbatore Dt.)	...	30,000

Filling of vacancies. This is not practised in the Noyyal valley. The deaths of plants are few. The seed rate is large. The ryots therefore do not feel the necessity to fill the blanks.

Ratooning is practised in the Noyyal valley but by very few ryots. The ratooning is not found profitable by the ryots here. It is only a tenant of slender means, that takes a ratoon crop. The yield obtained from a ratoon crop is about 15 podies (1 podi 250 lbs,) which, say at Rs. 20 per podi, equals to Rs. 300 and that from a first

crop is 30 pothies or Rs. 600. The saving to the tenant in cultivation expenses from a ratoon crop is about Rs. 100. From a ratoon crop then, the tenant saves Rs. 100 in initial expenditure but loses Rs. 200 in the harvest. In Singanallur therefore, one can hardly see ratoon crops in more than one or two holdings.

Irrigation.

The cane crop is as a rule irrigated once in 8 days. The interval between two irrigations is lengthened to 10 days in retentive clay loams and shortened to 6 or 7 days in sandy loams. Soils of sandy character are not much used for cane cultivation owing to difficulty of their irrigation unless the source of water is a good tank or a canal.

In Singanallur and Suler villages the source of water supply to wet lands is a tank which is fed by the Noyyal river. This river flows for about 6 months in the year and is practically a stream which runs dry in summer. The tanks dependent on this river similarly supply water for about 6 months in the year from July to December. The wet land ryots have therefore got a well in each wet land holding, from which water is baled out to crops for the remaining 6 months. Water is used with certain amount of economy for the sugarcane crop in garden lands. Roughly estimated, the total quantity used in garden lands is about 60 to 65 inches including the annual rainfall of 22 inches. The water used for the cane crop in wet lands is estimated to be 70 to 75 inches including 22 inches of rainfall. In the case of thin varieties such as *chittanahal* which was being grown in the gardens in the past, required much less i. e., about 50 to 55 inches of water. Sugarcane is a plant which revels in excess of moisture. Abundant water supply is a necessary condition for a successful heavy crop. The moisture that would be evaporated through the leaf itself will be immense and there is also the evaporation from the soil to be taken into account. Any curtailment therefore in the quantity of irrigation water for sugarcane crop will be an economy on the wrong side. There will be less harm done by irrigating sugarcane a little more than a little less.

Drainage. The lands with good drainage are generally selected for cane growing. If in the ryot's experience a certain piece of land is badly drained, he would altogether abstain from planting cane there. Good to fairly good drainage is as essential a condition for cane cultivation, as manuring and water supply. In our country we have well drained lands in enough area, and badly drained lands are exceptions to the rule. For the purpose of extension of sugarcane, want of well drained land will not stand in the way. The question of badly drained land and its improvement is not therefore of such immediate importance. But all the care a sugarcane cultivator has to take even on a well drained land is not to allow water to stagnate on the surface for over a day, and to drain off rain water collected in the trenches on receipt of every heavy rainfall. The idea is to keep the soil moist but not so completely blocked up by over saturation as to prevent access of air.

After cultivation. In Singanallur and Suler the ryots give 2 to 3 weedings and the same number of hoeings. The former are given in the first three months of its growth and the latter between the third and the 6th month. But there are many instances of ryots who had been content with giving one weeding and one or two hoeings. In all the sugarcane growing tracts of the Presidency, after cultivation may be said in general terms to consist of about 2 to 3 weedings and 2 to 4 hoeings. But there are places where practically no hoeing is done. Bellary is an instance to the point—where the ryots give only 3 weedings. In South Canara, the cane plants are earthed up three times with a view to fill up the trenches before the heavy rains of South West Monsoon set in, but no weeding is done. The cane field in this place will consequently be foul with weeds which is bound to tell upon the yield to some appreciable extent. Stirring of soil helps to let in air, accelerates nitrification and other chemical changes in the soil beneficial for the production of available plant food. The greater therefore the number of times the land is hoed, the better for the crop. But under no circumstances should this operation be done when the soil is wet—since this will more than defeat the purpose intended.

Wrapping and Propping. Neither the one nor the other is practised at Singanallur and its neighbouring villages. Thick crops as the result of close planting and absence of very tall growth in the crop, dispenses with these operations. In parts of the Circars these operations are done when the canes grow very tall but have a weak hold in the ground.

M. Mangesa Rao.

(To be Continued.)

Notes.

Crow as a natural enemy to insect life:—On a certain morning while setting out for work, I happened to observe a crow taking hold of a Rhinoceros Beetle near the Farm manure-pit. Tempted by curiosity, I passed to notice what happens to the creature. The crow first pulled off the legs of the Insect and went on pecking at it for sometime and flew away leaving only the thick hard wings—observed by C. R. S.

Ratoon cholam:—There is a practice of ratooning the cholam crop in the Karur Taluk. The land intended for cholam receives sheep penning generally. In the month of March—April, Chinna Vellai Cholam is sown under well irrigation. If at the harvest time, the stubbles are found to be strong and the yield of grain satisfactory, the crop is harvested leaving 6 inch stubble. Cattle are then allowed to graze. Hoeing is done which is then followed by irrigation. Sometimes the ground is hard when watering is done first and then hoeing. No other operation is done. The crop comes to maturity much earlier than the first crop i.e., in about $2\frac{1}{2}$ months. The yield is generally $\frac{3}{4}$ to $\frac{1}{2}$ of the first crop. All the cholam varieties are treated in this way where the land is rich and the yield good. This goes by the name of "Pudangu Cholam". W. R.

Destruction of sugarcane grub:—The following method for poisoning cane grubs recommended by Mr. Edmund Jarvis has the merit of being cheap and one which would commend itself even to the conservative agriculturist. It consists in growing cowpeas between sugarcane rows, spraying them with arsenical poison and afterwards ploughing them in. This method while serving as a bait for the cane grub, improves the condition of soil and also adds valuable nitrogenous manure to the soil. Grub infected tracts may try this simple and harmless remedy. K. K. R.—(*Australian Sugar Journal*).

Utilisation of Pine-apple waste:—A patent has been taken at the United States of America for the utilisation of Pine-apple waste. It is comminuted and pressed, the juice is then strained, and the pulp diffused in water at about 160° Fah (71° cent). 20 lb pressure per square inch is then applied to remove the remaining juice, after which it is dried and used as a source of cellulose. The pressed and diffused juices are mixed, heated to 180° Fah (82° c) to coagulate the albumen, and the albumen recovered. The remaining juice is treated with a neutralising reagent which forms an insoluble compound with Citric acid, and leaves a slight acidity. The juice is filtered from the citrate, concentrated under diminished pressure to precipitate the remaining citrate and again filtered. The syrup obtained is heated to 160° F (71° c) decolorised, and used as a sugar-syrup for canning purposes.

B. V. N.

A water-finder saves our brave troops at Gallipoli:—Those of our readers who were present at the last Agricultural Conference can easily recall to their minds the lively discussion that followed the address of Mr. Narayanamurthi, B. E. on the use of the Water-finder. To a few the discussion looked as if it was entering the regions of mysticism. We were pleasantly surprised to read in

the *Madras Times* of the 10th October 1916, that about a month after the discussion at Coimbatore, Sapper Stephen Kelley of the 3rd Australian Light Horse Brigade saved the men from a rather serious situation as regards water supply soon after their landing at Suvla Bay in August 1915. Stephen Kelly who had a reputation among his fellows for his capacity to spot out subterranean water told Brigadier General Higler that there was water in proximity and that he could find it. A thousand men were immediately placed at his disposal with the result that there was soon an abundant supply of cool spring water both for man and beast. Stephen Kelley is a Kentish man and learnt the art from an old man at Queensland. He used a copper rod at Gallipoli made from the band of a shell. T. S. V.

Artificial manures:—The application of artificial manures to the South Indian soils is still in an experimental stage. Their use is restricted to Government Farms and planters. The experiments conducted in the Samalkota Farm have not been quite encouraging. The result of the application of artificial manures to different crops have been published in Bulletin No. 76 of 1915 by the Bombay Agricultural Department. A summary of the result is noted below for the information of those who are keen on using artificial manures.

Tobacco:—Irrigated tobacco gives good result with artificial manures. (Sulphate of potash 224 lbs. per acre, Nitrate of soda 285 lbs. per acre and Super phosphate 336 lbs. per acre). There is no use in applying artificial manures to non-irrigated tobacco.

Potatoes:—For this crop also, artificial manures are not recommended if the crop is not irrigated. Profitable returns have been obtained by the application of the following manure to the irrigated crop:—

Sulphate of Potash	...	150 lbs.
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Superphosphate	...	112 lbs.
Nitrate of Soda	...	170 lbs.

Wheat:—The use of artificial manures is of doubtful value to this crop. Good yields were however obtained by the use of superphosphate and sulphate of ammonia.

Cotton:—Artificial manures can only be profitably used for cotton where the rainfall is reliable or where there is irrigation. Artificial manures should not be used alone. They should always be supplemented by cattle manure. Potash was found useless. Nitrates of soda and lime were better than Sulphate of ammonia. Artificial manures hastened the maturity of cotton. The mixture recommended is the following:—

Two tons of Farm yard manure ploughed into the land.
200 lbs. of superphosphate drilled with seed.
135 lbs. of Nitrate of soda top dressed six weeks after sowing.

Sugarcane:—Ammonium sulphate has been found to be a good substitute for safflower cake in black soils. In sandy soils, safflower alone has given the best results. In our Presidency castor cake is very extensively and profitably used.

Chillies:—Sulphate of Potash appears to be an essential element in the manure. Very good results have been obtained by the use of 180 lbs. of sulphate of potash, 224 lbs. of super phosphate 60 lbs. of sulphate of ammonia and the usual Farm yard manure to the chilli crops of Nasik.

Onions:—Nitrogenous artificial manures—375 lbs. of ammonium sulphate or 500 lbs. of sodium nitrate as top dressing were found very profitable.

Lucerne:—Superphosphate gave good results. 4 lbs. of Farm yard manure, 250 lbs. of superphosphate and only 15 lbs. of ammonium sulphate gave good outturns.

Bananas:—4 lbs. of castor cake plus about $\frac{1}{2}$ lb. of each of the usual artificial manures applied in three lots, one month, 2 months and 3 months after planting respectively gave good results.

K. K. R.

Games.

Foot-ball matches:—

1. A friendly match was played on our grounds between the two teams representing the Stanes and the A. C. R. I. From the kick off the ball was hovering over the opponents goal and our offence could not take advantage of it. On the whole the match was a contested one. The opponents had serious falls on account of the rash play exhibited by some of the half-backs. When the match was over, both the teams were considered to be equal.

2. A second match at foot-ball was played with the L. M. H. School during His Excellency's visit to our College. The play was one sided. Our defence was broken by the absence of Samuel who was suffering from fever. To the opponents' credit they put a goal and they were left the winners of the day.

Hockey matches:—

1. A hockey match was played between A. C. R. I. and the Stanes on the Stanes' grounds. From the bully off the ball was up and down the field paying dangerous visits to both the goals. From the second half the play was favourable to the opponents who took advantage of a corner in scoring a goal. Not satisfied with this they put in another goal to their credit and were the winners of the day.

2. A match was played with the Coimbatore United Club on a rainy day. As the hockey ground was very wet the

match was played on the foot-ball ground which was better. There were many obstacles before a man could reach the goal as the fast running resulted in a fall. The match ended in a win for A. C. R. I. by 1 goal.

Cricket matches:—

1. Two matches were played for this month. The first match was played with the United Club and it ended in a draw. On that day Vittal Rao scored the highest number of runs.

2. The second match was played with Madras Forest College. The Forests won the match by a narrow margin of 22 runs. R. Cecil Wood Esq., the Principal of the College scored the highest number of runs.

Hockey colours have been awarded to the following players:—

Dharmalingam S.

Onkaram P. J.

Abhishekanatham.

Mariasusai.

Departmental Notes.

I. M. R. Ry., T. R. Ranganath, Assistant in Mycology, is granted privilege leave for 1 month from 3rd October 1916.

II. An extension of privilege leave for 7 days from 1st to 10th October 1916, is granted to M. R. Ry., T. V. Rajagopalachari, Farm Manager, Hagari.

III. M. R. Ry., K. Narayana Ayengar, Agricultural Demonstrator, Mayavaram is permitted to avail himself of the two months privilege leave granted to him from the 12th instant.

IV. One month's privilege leave from 15th October 1916 recommended by the Government Mycologist to his Sub-Assistant P. Vishnu Somayajulu is granted.

For grown up sons of the farmers, the teaching that is given in Vernacular at the agricultural school at Loni in the Bombay Presidency seems to be the best and is worth a trial in other Presidencies also. Mr. Sayer truly observes that direct teaching of agriculture in rural schools is to be deprecated but giving it an agricultural tinge in the shape of nature study and school gardening is recommended.

Instead of the usual cheap sneer at the conservatism of the ryot, he espouses his cause and approves of the ryots' methods. The policy of the Indian ryot in cultivating two crops at a time is upheld.

Mr. Sayer's general ideas about the introduction of new methods and the necessity for imparting mechanical education are worthy of consideration. What India needs is not so much the introduction of expensive machinery from abroad as the systematic transfer of the best agricultural practices from one part of the country to another. India has been an agricultural country for centuries. Every tract after many trials has settled itself down to some definite agricultural practices, so that, improvements should be recommended only after thorough trial extending if necessary over a period of years.

On the importance of mechanical education, Mr. Sayer aptly says "The present war has given England an enforced mechanical education, the use of which will never be forgotten by the nation—for it is not the knowledge of classics and certainly not a knowledge of Law which is beating the German."

The article breathes a spirit of toleration and shows that the writer has grasped the agricultural requirements of the country.

We invite the attention of our readers to G. O. No. 1820 Revenue dated 10th August 1916, embodying rules regarding the grant of land *on darkhast* for opening cattle or dairy farms. Each application will pass through the Director of Agriculture, after having received the support of the Collector of the district and the former officer while transmitting the application to the Board of Revenue, will lay down certain conditions under which the above grant will be made.

Facilities for
opening
cattle and
dairy farms
in the Pre-
sidency.

These conditions will include, the number of cows and bulls to be kept, the castration of young bulls, the separation of the cows from the rest of the village cattle, the kind of grass or fodder that should be raised on the land etc. The fact that the Department of Agriculture will have a control over such grants augurs well for the success of the scheme. We hope that some of the members of the Union will, ere long, avail themselves of this opportunity to start cattle and dairy farms.

We are glad to learn that Mr. Sankara Kumar Pillai, an ex-student of this College and apparently farming on his own account, is doing very useful work in the Tinnevely district. He is said to have successfully introduced the economic transplanting of paddy and artificial and green manures in ryots' lands. We trust more students of this college will follow his good example, without rushing into service in the department.

An old
Student.

Sugarcane crop, its past, present and future in relation to Noyyal valley.

(Continued from page 264 of October Issue.)

Manuring during the growth of crop. It has been already said that in this tract sheep-penning at ten thousand sheep per acre as a preliminary planting of cane was a rule in the past. But this practice has been practically given up in wet lands at present. The solitary instances of wet land ryots who yet have recourse to this practice, will be only exceptions to the rule. The ryots neither give any other manure in its stead. They only apply 6 to 8 cart loads of Kolinji leaf carted from hills and costing Rs. 7 to 8 per cart load, as top dressing when the crop is 3 to 4 months old. Some apply groundnut cake in place of Kolinji leaf at 60 maunds or 1,500 lbs per acre costing about Rs. 40 to 50. While the actual quantity of Nitrogen utilised by a sugarcane crop from the soil has been calculated to be about 100 lbs, the experiments conducted at Manjiri Farm show that at least 350 lbs of Nitrogen is required to be applied to the soil to give a full crop. I have personal knowledge of ryots around Manjiri near Poora having got very heavy yields of jaggery by heavy manuring and I feel quite sure that by application of more manure than is now done by ryots better yields can be obtained, and that the extra expenditure on manure will be more than compensated by the additional yield. Sugarcane crop is one that readily responds to heavy manuring. Economy requires that a manure which is both cheap and good should be looked for. The one manure which fulfils the condition is the green manure. This system of manuring, supplies Nitrogen on the one hand and improves the physical properties of the soil on the other. No system of manuring is therefore economical, unless green manuring forms part of it.

Varieties of canes. The varieties of canes met with in Singanailur and other near villages are (1) Poovan or Rastali (2) Vellai (3) Kaludai Boodan (4) Namam (5) Karun or Shenkarumbu (6) Chitta nanal. But the main variety that is now cultivated is Poovan and

other varieties are found mixed with it. In Sular, Kaludai boodan is preferred owing to its hard rind, and the mixtures found here are Namam and Vellai.

About 80 years ago, the chief varieties of cane cultivated in this tract are said to have been Karun Karumbu and Chitta nanal, so far as it can be ascertained from the oldest people living here. The former is a dark red cane of middling thickness and the latter a thin hardy variety. In about the year 1840, the Government introduced a new Mauritius variety in all the cane growing tracts of the Coimbatore district. The people called this variety Vellai or Rastali because of its white rind. This variety became gradually popular with the ryots on account of its better yield both in quantity and quality—until at last it became the chief variety grown, while its predecessors Karun karumbu and Chitta nanal only formed mixtures. The Vellai continued as the main variety for nearly 40 years, and thereafter gave its place to Poovan, in the Noyyal valley, while Vellai still continues to be the main variety in the Amaravathi valley. The causes that led to the displacement of vellai by Poovan in the Noyyal Valley as given by the ryots are conflicting. There are no other sources from which more accurate information could be obtained. The different versions of the ryots are:—(1) That the Vellai crop suffered seriously from an attack of small worms eating away the root system—which resulted in complete or partial failure of the crop—while the minor varieties which formed the mixture were affected to a much less extent.

(2) Degeneration of the Vellai cane in course of time.

(3) That Vellai required more water, more manure, and better attention. That it could not withstand any delay or withholding of even one or two of the necessary number of irrigations, that a little neglect was attended with short outturn—while the cultivation of other varieties was far easier owing to their more hardy character.

The first version has to be rejected on the ground that the small worms spoken of by the ryots could not have made any distinction between Vellai roots and roots of other varieties for committing their havoc on, while both were growing in the same field. Version

numbers 2 and 3 are within the bounds of probabilities. Good varieties of canes require systematic cultivation and systematic irrigation—unlike inferior varieties which mostly happen to be also more hardy ones comparatively. Good varieties deteriorate under neglected cultivation, deficient manuring or deficient irrigation. While the versions number 2 and 3 are accepted, it implies that there must be some difference between the Noyyal valley and the Amaravathi valley in some main conditions, as in the latter Valley, the vellai canes have prospered and yet continue to be the variety of main importance. The difference in their conditions lies in the fact that Amaravathi valley is a more fertile tract with more certainty of water supply from the tanks almost throughout the year, while the water supply in tanks of the Noyyal valley is uncertain, and limited. From the above differences, it may be inferred that the Vellai variety might have received better attention in the Amaravathi valley than in the Noyyal—with the result that that variety prospered in the former and deteriorated in the latter.

Poovan is presumably an indigenous variety and no accurate data are available as to whence it was introduced. The ryots say that it was a variety of cane found growing in mixture in the Vellai crops which was least affected by the attack; and that a certain ryot picked it up and grew it. The better success of this ryot induced the other ryots to copy him until at last the Poovan became the main variety of cane grown in the Noyyal valley.

Introductions from time to time of new varieties with higher sucrose contents and suitable to local conditions, may immensely contribute to a better future of the sugarcane crop. In this connection, may be mentioned, the introduction of new sugarcane cultivation. In the year 1900, a number of Mauritius cane varieties were said to be distributed to ryots by the Government in the Vizagapatam district. But these varieties seem to have got both badly mixed and deteriorated in course of time in the hands of cultivators owing to indifferent cultivation. The then Government Botanist picked these up and transferred them to the Samalkot Farm for proper cultivation and identification. Such of them as he found to be the best were

distributed to the ryots and it is these that practically ousted the indigenous varieties in Circars. Introduction of red Mauritius—a heavy yielding variety on the West Coast by the Agricultural Department is resulting in the extension of sugarcane in that tract.

But it is expected that new varieties introduced, may after a long time, get deteriorated. Change of seed or change of varieties may therefore become necessary from time to time. A cane breeding station may therefore be of very immense value for evolving and supplying new useful varieties. B-147 is becoming more prominent in its sucrose contents as well as in the capacity of yield per acre, as seen from the results obtained both in Taliparamba and Palur Farms. It would appear that this when distributed to ryots may get into their favour as much as red Mauritius.

Diseases and damages. There is not much of the common diseases seen in the cane crops in this tract at present. The root worms which did much damage to Vellai crops in the past have already been referred to. White ant damage is not much in evidence, as the lands where cane is cultivated in this tract are almost all black loamy soils. Jackals do a certain amount of damage but thorny fences put up around canefields minimise the damage. In this connection it may be here mentioned that the laying of the fences with thorns and twigs, though cheaper in its initial outlay is not so in the long run. This fence costs the ryots Rs. 25 to 30 per acre while it is not so effective as the wire fence, nor is lasting, quarter as much as the latter. The ryots of this tract do well to put up wire fencing 6' high round their cane fields at a cost of Rs. 75 per acre. This material, if well handled, will last to the ryots at least 5 or 6 years. The annual expenditure on fencing would in this case then, be reduced to Rs. 15 per annum while it is at least Rs. 25 at present. The wire fence is therefore not only cheaper but also more effective as a barrier to jackals than the thorny fence of the present, the materials of which, cannot last from one year to another.

One thing that is causing alarm to sugarcane cultivators in common with the betel vine cultivators, is the earth worm found in the

- soil in swarms. The ryots state that the earth worms do damage to the roots of young canes and vines. One or two fields are left uncultivated with these crops this year on this account. While the garden lands are free from earth worms, the wet lands have them in large numbers. Even among the wet lands, such fields as are kept in wet condition for larger periods are more subject to this phenomenon than other wet lands. The remedy seems to lie in cultivating these lands with some other crop than betel vine or cane for an year or two, and in the interval between crops to expose the land to the action of the sun after deep ploughing.

Yield. The yield of raw sugar per acre varies, in different parts of the Presidency depending on richness of soil, manner of cultivation, quantities of manures given, water supply etc. An idea may be formed of the variations in the yields in some of the parts of the Presidency, from the figures given below :—

District.	Average yield.
Godavery ...	10,000 lbs.
Coimbatore (Noyyal valley)	7,500 "
South Arcot ...	4,000 "
Vizagapatam ...	10,000 "
Ganjam ...	4,000 "
Bellary ...	5,000 "
Cuddapah ...	6,000 "
Kurnool ...	5,000 "
South Canara ...	3,000 "
Anantapur (Hindupur)...	8,000. "

In Singanallur an yield of 40 pothies (10,000 lbs.) is considered a good yield and 30 pothies or 7,500 lbs. an average yield. The oldest ryots of this village state that about 30 years ago, the average yield was about 20 pothies or 5,000 lbs. per acre. This statement is borne out by the figure of yield mentioned in Coimbatore District Manual—which refers to some year about 1885, that is about 30 years ago. The rise in yield by about 50% in these lands in the course of 30 years may be owing to the following causes :—

(1) The crushing in the past was being done in a wooden mill, which extracted less juice. The iron mill made its appearance some time near the year 1885.

(2) In the past the manure resorted to was only the penning of sheep before planting. Now the practice is to apply green leaf or kolingi at 6 to 8 cart loads per acre as a top dressing as already said. The extension and popularity of betel vine cultivation which crop is cultivated here in rotation with sugarcane with heavy manuring might also have much to do in enriching the soil in organic matter. The kolingi leaf carted year after year for application to sugarcane crop, must have also contributed to the richness of soil.

(3) The periodical carting of tank silt—must have also contributed towards the same thing.

Although the yield is slowly rising and the prices too, to some extent, yet the sugarcane cultivation is becoming less popular and the area under that crop is on the decrease as will be seen from the following statistics which relate to some of the important sugarcane growing villages of the Coimbatore Taluk.

Villages.	Area under sugarcane in acres.				
	Fasli	1320	1321	1322	*1323 or 1914-15
Singanallur	...	585	608	500	374
Uppilipalayam	...	192	215	148	77
Kuniamputhur	...	347	492	247	218
Kurichi	...	108	159	78	58
Kumarpalayam	...	133	150	32	18
Sircar Samakulam	...	102	102	69	81
Vellakinar	...	148	141	72	118
Agrar Samakulam	...	83	108	91	100
Thudiyaloer	...	23	56	6	59
Total...	1721	2031	1263	1103	

* This is an extract from the report of the Tahsildar of Coimbatore Taluk.

This anomaly can be explained by the following :—

(1) The rise in price of raw sugar has not kept pace with the rise in prices of other agricultural products owing to the imports of cheap sugar from foreign countries.

(2) The cost of production is high and getting also higher owing to the general rise in wages for labour, value of manure, rent of land etc.,

In other words the cost of production is high and the prices obtained are not quite adequate. It is no wonder then that cane cultivation is becoming less popular. To add to it there is the cotton which owing to its demand from foreign countries, has risen very much in value and its cost of production is at the same time less. The cultivation of this crop leaves therefore a good margin of profit. Compare the following cost of production of sugarcane and its profits with the same details for the Cambodia cotton crop given below.

<i>Cost of cultivation of sugarcane crop in wet land in Singanallur.</i>	<i>Same in garden in Uppilipalayam.</i>	<i>Cost of cultivation of Cambodia cotton in garden in Uppilipalayam.</i>
Preparatory cultivation 13—0—0	13—0—0	Ploughing 4—0—0
30,000 sets 45—0—0	45—0—0	Sowing and beds making 2—8—0
Planting, weeding and hoeing 22—0—0	22—0—0	Seed 1—0—0
8 cart loads of kolangi leaf and its application 70—0—0	leaf manure sheep. 120—0—0	Irrigation 8—0—0
Fencing 25—0—0	25—0—0	2 weedings 2—8—0
Cost of labour for irrigation 75—0—0	100—0—0	2 hoeings 4—0—0
Harvesting, milling and preparing jaggery 105—0—0	87—0—0	Manure 25—0—0
Assessment 10—0—0	2—0—0	Picking (paid in kind)
Total... 365—0—0	414—0—0	Assessment 2—0—0
		49—0—0
		say 50—0—0

Value of average yield in wetlands 30 pothies at Rs. 18 per pothi

540—0—0

Value of average yield in gardens

25 pothies at Rs. 18 per pothi 450—0—0

Value of 5 pothies of cotton at Rs. 30 per pothi

150—0—0

Profits

175—0—0

36—0—0

100—0—0

From the above estimates, it would appear that where a capital of nearly Rs. 400 has been spent in cultivation of sugarcane, the ryots get a profit of Rs. 175 in the case of wet land, but the profit reduces itself to Rs. 36 in the case of garden land owing to the extra expense of raising water and additional manure required for it and less outturn of jaggery obtained in the garden land in the Singanallur conditions. In the case of Cambodia cotton the ryot gets a profit of Rs. 100 per acre when he spends only Rs. 50. From the above facts it will be to some extent clear as to why the sugarcane cultivation is getting out of favour of garden ryots. In the garden lands of Uppilipalayam and Singanallur, where sugarcane was formerly being cultivated, one can hardly see any sugarcane at present. The place of sugarcane in garden lands has now been taken by Cambodia cotton. The sugarcane therefore is now practically confined to wet lands only. Even here, the sugarcane is not so popular as it was in the past. The ryots in Singanallur and Sular all state that the area under that crop in wet lands is yearly becoming less and less. A large amount required for the working expenses during the growth of the crop is a dissuading factor. But the redeeming feature in the sugarcane cultivation is that it keeps a large number of labourers engaged. It is owing to this fact, the cultivation of canes in wet lands is partly in the hands of tenants who take up land on lease paying rent of Rs. 75 to 100 per acre. The rent per acre for sugarcane cultivation was till the last year or the year before Rs. 100 and sometimes more. The rent has fallen now to Rs. 75 per year per acre. This in itself is enough evidence of the cane cultivation losing its popularity by degrees.

The wet land ryot sometimes prefers to grow a paddy crop and a Chitrai cholam crop with far less trouble and far less working expenses than required for sugarcane crop. The prices of jaggery are fluctuating. The risk of loss in case of the fall in price of jaggery is another point for consideration for the ryot who by habit is shy of speculation. The fluctuations in prices of jaggery are owing to local demand in relation to its supply. Higher prices in one year are followed by larger production in the next, the inevitable result of which is a fall in prices. But the sugar market only controls the maximum limit to which the price of jaggery can rise or in other words, if price of jaggery rises and approaches that of sugar, the major portion of its previous demand will divert to sugar as the better of the two and price of jaggery then is bound to fall for want of demand. The above remarks refer to pre-war period. Now owing to the war, sugar from Germany and Austria has stopped, consequently the price of sugar has risen by 33% already. Owing to this, I expect a portion of demand for sugar will divert to jaggery whose price will consequently rise, and I am confident that the area under cane in the next year may therefore become larger.

M. MANGESA RAO.

(To be continued.)

Green Manures for paddy on the West Coast (Daincha and Cow gram).

In Calendars published by this Department a good deal has been written about green manures. The importance of the subject amply justifies its repetition in this Journal. It must be admitted that the value of green manure for crops on wet and garden lands was well known to the ryots long before the advent of the Agricultural Department. This is evident from the general practice of applying green leaves both for such garden crops as sugarcane, betel vines, cocoanuts, arecanuts, ginger etc., and for paddy on wet land. It is also commonly known to ryots that a cereal crop after a pulse grows much better than a cereal

following another cereal. Why it is so they are unable to explain. But the idea of raising a leguminous crop and ploughing the whole of it into the land solely for enriching the soil is quite a new one. Apart from the question of enriching the soil, the organic stuff thus ploughed into the soil improves the texture and drainage of that soil. This opening out of the soil results in making more plant food available for the crop. The net result is a better crop. This fact has been well realised not only on the Experimental farms of the Agricultural Department, but also by all ryots who have given this system a fair trial. The fact that sufficient green manure seeds for 20,000 acres were sold last year by the Department must eradicate from the minds of the most conservative ryot any doubt still lingering regarding the efficacy of the system.

It is unnecessary to discuss here the question whether it is more advantageous to bring in green leaves from the jungle and apply to the land or to raise a green manure crop and plough it into the land for the simple reason that there is always a scarcity of green leaf; and even when it is available the price is in most cases exorbitant, particularly so in the coast taluks. It is very much to be regretted that the system of growing green manure crop has not yet become a common practice in the West Coast Districts.

We shall now consider how green manure crops can be raised and how far the trials already made in the West Coast have been successful. In South Canara, as in Malabar, there are three kinds of wet land, Bettu (high lying land), Majal (medium level), Bailu (low lying). In Bettu one crop of paddy crop is raised. By the time the paddy crop is off the field, the land is too dry to raise a pulse crop. But in rare cases, horse-gram is sown some 10 or 15 days before the harvest of paddy. This crop generally grows moderately well and gives a fair outturn. In Majal, one crop of paddy is grown and this

is followed by a pulse crop, whereas in Bailu, two crops of paddy (and sometimes even three crops of paddy) are invariably raised as well as a pulse crop. It is in the last mentioned class of land that Daincha has been tried as a mixed crop with pulse. The second crop paddy is harvested in January; black-gram or green-gram is sown mixed with Daincha and harvested in April. Daincha is left in the field till June when it is cut, the field puddled, and paddy then transplanted as usual. The moisture already contained in the soil is enough to germinate the gram and Daincha seed. Hot weather rains in April considerably help the growth of these crops. By the time the crop is ready to be cut, the plants are about 8 feet high. The green stuff obtained for ploughing into the land may be estimated to be worth about Rs. 15 per acre, whereas, the actual expenditure for raising the crop includes only the cost of the seed which is about Rs. 1-8-0 per acre. The usual seed rate for the pulse crop commonly grown is about 15 local seers roughly equal to 10 Madras Measures. It is recommended to sow 10 seers of pulse and 3 of Daincha as a mixed crop. Trials were made in three villages in the year 1913 and in 10 villages of different Taluks in 1914 and over 25 in 1915. The paddy grown after the ploughing in of the green manure gave remarkably good yields. The ryots who grew green manure appreciated the value of the system. Some of them have collected their own seeds for next year's use, and applications are being received constantly for supplies of seed. Now that the system has been found to be advantageous it is the duty of all who have tried it and are satisfied with its results to give wide publicity to the system.

In Malabar the conditions are different, the paddy cultivators generally speaking are not quite so keen as those of South Canara. The excellent practice of raising a pulse crop after paddy is far from general. The bulk of the paddy lands in the North of the district are single crop lands and they are left without any crop from November to June. After the harvest of paddy

the land should be ploughed 4 or 5 times and kept ready in the hot weather. This practice of ploughing the land is not, however, recommended where the land is clayey and has a tendency to crack. Cow gram should be sown immediately after the showers in April—May, and even before the rains if there is sufficient moisture in the soil for the seed to germinate. The seed rate per acre is about 5 to 6 Madras Measures; bazaar seed being quite good enough for the purpose. This will have about 30 to 40 days for the gram to grow. As it is a quick-growing crop, the field will be well covered before it has to be puddled for the paddy crop. The gram crop is ploughed in and paddy transplanted in June. As a result, the paddy gives a better yield. For the last eight years this has been done on the Taliparamba Agricultural Station with great success and the paddy land has already improved considerably. Trial crops of cow gram green manure have been raised in different parts of North Malabar and South Malabar for the last two years. The trials were in the majority of cases successful and the paddy was found to give higher yields. The chief objection that ryots have in growing green manure crops is that the cow-gram is eaten away by cattle, and they consider it expensive to fence the crop. But if all the cultivators in a plot of land could arrange amongst themselves to cultivate the crop, the difficulty vanishes, for then, there will be no necessity for fencing the area. The paddy crops now raised are not fenced and good care is taken that animals do not damage the paddy. The same might very well be done with other crops. It is therefore earnestly urged by the department that ryots should take up the practice and reap the benefits which will follow if the instructions given are carried out.

It is also recommended that the system of raising a pulse crop after paddy as is done in South Canara should also be more widely adopted in Malabar.

M. GOVINDA KIDAVU.

Correspondence.

To

THE EDITOR,

JOURNAL OF THE

MADRAS AGRICULTURAL STUDENTS' UNION,

COIMBATORE.

SIR,

In the August issue of the Journal while drawing the attention of your readers to a contribution on the Students' Union by 'Hustle,' you kindly promised to devote some space for correspondence on the subject of directing the funds and activities of the Union.

'Hustle' is perfectly justified in raising the question at issue and the thanks of the Union are due to him. I have read with much interest his article, but although at the outset he proposes ways and means to extend the programme of the Union, the key note of his article seems to be "How best can we spend the accumulated funds"? In his extreme anxiety to spend the money, he suggests means to fritter it away. For instance, investing funds on medals, prizes, tennis courts etc., are some of his suggestions. To say that it is better to spend too fast than too slow is purely a western idea and it is not likely to generally commend itself to Indians. It ought also to be borne in mind that the present funds are really the life subscriptions of many of the present members and it is not likely that the funds will continue to accumulate in future in the same proportion as in the past. When we come to think of it, there is not so very much money likely to lie idle.

'Hustle' also suggests translation work and the formation of sub-committees to investigate into economic questions such as leases. The suggestion though excellent in itself is impracticable as it is not known who have the time to do such work. A

majority of the members of the Union are either students or Government officers who can ill-spare the time. It would indeed be a good thing if all the members strive to make the journal a first class concern. I hope many will agree with me that there is much room for improvement in the quality of matter and in the size of the journal. The whole work at present devolves on the committee and many of the mofussil members are simply lookers-on. If every member, mofussil or resident takes upon himself the responsibility of contributing his mite, a great deal might be done towards the improvement of the journal. The journal is not intended to be run at a profit and every anna obtained over and above the cost of running it might be utilized, in making it more attractive. A certain amount of money from the capital funds may be utilised, if necessary, to include original photographs and blocks for insertion in the journal.

One of the students of the college is being benefited by a loan from the Union. It remains to be seen how far the present incumbent is going to take full advantage of the privilege, and it may safely be assumed that upon this experiment depends the future policy of the Union in the utilisation of its funds in this direction. It is also suggested that the Union might arrange to send promising young men to foreign countries. I do not think that this is necessary as the Government themselves have undertaken to do this at the termination of the War.

Now that the Union has been successful in obtaining over Rs. 2000, it is time that it provides itself with a habitation. The officers have a club, the students have a pavilion, but the Union is only permitted to stay in a room kindly lent by the Principal. This is not what it ought to be. The present funds ought to be able to provide a sufficiently commodious office with provision for extension.

When this becomes an accomplished fact and more funds are forthcoming, the Union might concern itself with providing a

lending and circulating library. Although the library at the college is excellent, red-tapism does not permit its being as useful as it might be. Besides, the library would be of immense value to many of the mofussil non-officer members who never can have access to the college library. These are only a few suggestions out of many that strike one. But they may be too ambitious for our present purposes. Money is sure to come provided we have a definite and useful programme. With the Government and the landed aristocracy on either side of us, who can deter us from marching onward on the path of progress unless it be our own pessimism?

Yours &c.,
A member.

Notes.

Nutrition of Proteids:—The view almost universally held until now, with regard to the nutrition of proteids is that food-proteids like the gluten of wheat are acted upon by the digestive juices in the alimentary canal and converted into soluble peptones which are then absorbed by the blood vessels and converted into body proteids like the myosin of the muscle. In a lecture delivered before the Chemical society a few months ago, Professor F. G. Hopkins, Biochemist, states that food-proteids are completely broken up in the intestines into about 18 simple amino-acids of definitely known composition, that these amides are absorbed in circulation and carried to the tissues which have the power of synthesising suitable body-proteids. That peptones are not found in blood vessels, that peptones injected into the system cause poisonous symptoms in some cases and total excretion is as such in the urine in all cases and that a number of amide bodies have been found to be present in the blood, these form strong presumptive evidence in favour of Professor Hopkins's views. His conclusions, however, have been derived from carefully conducted experiments on live rats, these animals having been found to be

the best adapted for various reasons. The rats were fed on artificially prepared mixtures of amides, from some of which a few of the amides were left out. A few typical amides seem to be essential for growth, as their withdrawal causes death; while others are not quite essential as the same are synthesised in the system of the animal. Professor Hopkins states that the supply of diverse amino-acids induces the construction of new tissues in growing animals and repair of waste tissues in adults; in other words, that there is a selective condensation of the various simple compounds—amino-acids—into proteid complexes of more or less definite structure.

To those who are conversant with the analysis of food stuffs, the question suggests itself:—"If amino-acids are the chief source of proteid supply, is there any need to distinguish between true albuminoids and amides in food stuffs and to characterise the former as more valuable than the latter in animal nutrition?" This aspect of the question must be specially interesting to all those who are practically engaged in the feeding of animals.

(M. R. R.) *From the Journal of the Chemical Society.*

Rice Protein:—In a recent bulletin Mr. Sen states that the protein of rice more nearly resembles the majority of the proteins of animal tissues than do the proteins of maize and wheat. This is an interesting information and explains the fact that rice, in spite of its low protein content, furnishes food for more human beings than any other cereal. (K. K. Rao.)

Anaikombu in Paddy:—The readers of this Journal may perhaps remember about the notes which appeared on this subject in 1915. Since then some further light has been thrown on this obscure disease through observations made at the Research Institute Coimbatore.

The eggs of the fly have been at last discovered. They are laid about the region of the ligules in young plants. The young

maggots hatch out in 3 days, creep down the stem between the leafsheaths, and seek out the growing points of the apical or the side buds. They feed on the tender nutritious tissues of the buds and turn into pupae in the hollow chamber thus formed. The chamber now elongates and forms the "*Anaikombu*" or silver-shoot.

It has also been found that this formation is not confined to paddy alone but is common on various wild grasses. 3 of the common grasses at the wetlands at Coimbatore show this kind of malformation. Several other grasses showing similar silver shoots have been found in Bellary, Kurnool and Godavari districts. Further investigation may show that this phenomenon is widespread among grasses in the presidency.

At first it was thought that the grasses in which these formations were noted would prove to be the host plants of the paddy gallfly (or *Anaikombu*). Comparison of the flies bred out of the 3 grasses at Coimbatore showed that all were different species which confined their attention only to particular grasses. Recently at Samalkota, a grass (*Panicum stagninum*—*Bontha ooda* in Telugu) has been found the abundant galls which seem to be caused by a fly that appears to be identical with the paddy one. Y. R. Rao.

Henbane:—The recent dearth of the alkaloid atropine and its congeners, hyoscyamine and hyoscine (*scopolamine*) and the high prices commanded by these solanaceous alkaloids, which are largely used in ophthalmic medicine, is due to their manufacture having been carried on in Germany. Some years ago a solanaceous plant (*Hyoscyamus muticus*), closely allied to common henbane and growing wild in Egypt, proved on investigation at the Imperial Institute to be a most valuable source of these alkaloids, and since the outbreak of war the Imperial Institute has arranged for large quantities to be sent from Egypt to this country, where it is now

being employed by manufacturers. Before the war, Germany had taken nearly the whole of the supply from Egypt.

The same plant grows in India, but investigations at the Institute have shown that the wild plant from Northern India apparently may contain less alkaloid than that from Egypt. In view of the demand for the drug, which is not likely to be met from Egypt alone, the question as regards the Indian plant deserves further investigation.

The same is true of the related plant, *Datura Metel*, which on examination at the Imperial Institute has shown to contain the valuable alkaloid *scopolamine*, though with Indian samples in smaller amount than is usual in the plant grown in other countries.

On the other hand, *Datura Stramonium* from India has furnished quite satisfactory amounts of alkaloid, and if procurable in quantity would be of value.

The question of the production in India of solanaceous plants is one which is worth further consideration. For commercial production the collection of wild plants could not be depended on, and cultivation would have to be undertaken. This would not be difficult, as the plants grow readily especially in Northern India.

Thymol:—Thymol a solid substance derived from the volatile oils of certain plants, including Thyme. It has been extensively used as an antiseptic during recent years and manufactured almost exclusively in Germany. The best commercial source of thymol is the volatile oil of Ajowan seed (*Carum copticum*), a kind of caraway, which is abundant in India. Before the war almost the whole of the exports of Ajowan seed from India went to Germany for the manufacture of thymol. As a result of the war there was at once a serious shortage of thymol in this country, and the price rapidly rose to eight times its usual level. There was, however, no reason why the manufacture of thymol should not be under-

taken in the United Kingdom from the Indian ajowan seed. The Imperial Institute accordingly drew the attention of British manufacturers to the subject, and offered to put them in touch with Indian exporters of the seed, which was virtually unknown to manufacturers. In response to this, offer a large number of enquiries were received at the Imperial Institute from firms in this country, some of whom obtained consignment of Ajowan seed from India for the purpose of starting the manufacture of thymol, which is now definitely established.

Games.

1. *Hockey Tournaments*:—The above tournament which had only eight entries, all town teams, opened in the first week of this month with the match between the Agricultural College and the Coimbatore College, on the Recruits grounds. The match witnessed a very one-sided contest, the Agriculturists easily winning the match by the wide margin of six goals to one.

The second match was played between the Recruits and our team the same grounds and it was a one sided game. From the very start, the Agriculturists led by Mr. Parnell carried the ball very well and finished in successful aims. The Recruits never seriously threatened our goal and once or twice they managed to come near, only to be beaten back by our defence. As it was getting dark, the whistle blew and the match ended in a win for the Agriculturists by 11 goals to nil.

The finals was played between our team and the Stanes' High School on the Recruits grounds. A tough fight which was then expected had attracted a fairly good number of spectators. Soon after the commencement, the Agriculturists took up the ball and for about 10 minutes kept up a close pressure against the other goal. The pressure was utilised in scoring a goal, amidst loud cheers, by Rangaswamy of our team. Afterwards the pressure was

relieved the Stanes took up the attack and scored a goal. They pulled up for the rest of the time in scoring two more goals before the second half. On crossing over, the Stanes asserted their superiority. They attacked with great vigour which resulted in 3 more goals for them. When the whistle sounded, the Stanes were left winners of the cup by a wide margin of 6 goals to 1.

2. *Cricket match*:—A friendly match was played between the two teams representing the Agricultural College and the Forest College on the Agricultural College grounds. The match ended in a draw.

3. *Hockey*:—Two friendly matches at Hockey were played on our grounds between the Reserve police and our team. The first match ended in a win for the Reserve by 6 goals to 1. The second match was better contested and it ended in a win for A. C. R. I. by 4 to 3.

Departmental Notes.

1. Mr. Hugh Charles Sampson, B. Sc., Deputy Director of Agriculture, Madras, on return from leave, to be in charge of V and VII circles, with headquarters at Trichinopoly.

2. Mr. Roger Thomas, B. Sc., on relief by No. 1 to be Deputy Director of Agriculture, VI circle Madura, Ramnad and Tinnevely with headquarters at Madura.

3. The following appointments of clerks are ordered:—

1. U. V. Venkatasubayya, 3rd clerk Principal's office, Coimbatore to be Head clerk VI Circle Madura, to join forthwith.

2. T. K. Subramania Ayyar, 2nd clerk Deputy Director's office V and VII circles and acting accountant in the same office, to be accountant, VI circle.

3. M. D. Subbaratnam, Typist Assistant Director of Agriculture, Southern circle's office to act as Typist, VI circle, while the Assistant Director of Agriculture Southern Circle is on leave.

4. K. S. Subramaniya Ayyar, Head clerk, Government Agricultural chemist's office and sub-protem 1st library clerk to be 3rd clerk, Principal's office (vice No. 1)

5. M. B. Venkatarama Ayyar, Head clerk Government Mycologist's office to be 1st Library clerk sub-protem (vice No. 4).

6. T. Seshagiri Rao, 2nd clerk Deputy Director's office 1, 11 and 111 circles Bellary, and acting head clerk Government Economic Botanist's office to be head-clerk, Government Mycologist's office (sub-protom vice No. 5).

7. N. Kunhiraman Nair, Head clerk Deputy Director's office 1, 11 and 111 circles, Bellary to be Head clerk, Deputy Director's office V and VII circles, Trichinopoly (vice No. 8).

8. Ramaswamy, Head clerk, Deputy Director's office, V and VII circles, Trichinopoly from 1st November 1916 to be Head clerk Deputy Director's office, 1, 11 and 111 circles, Bellary (vice No. 7).

9. K. Venkata Rao, on combined leave to continue to be Accountant, Deputy Director's office V and VII circles, Trichinopoly from 1st November 1916.

10. S. Sankaran Pillai, Head clerk, Assistant Director of Agriculture Southern Circle's office, Trichinopoly, to act as accountant in the office of the Deputy Director of Agriculture V and VII circles (vice No. 9) while the Assistant Director of Agriculture, Southern Circles is on leave.

11. V. Babugopal, Typist and acting 2nd clerk Deputy Director's office V and VII circles, Trichinopoly, to revert as Typist in the same office on the abolition of the 2nd clerk's post there.

12. The privilege leave for 1 month granted to M. R. Ry., T. R. Ranganath, Assistant in Mycology from 3rd October 1916 is extended by 15 days.

Mr. T. V. Subramanyam, B. A. is appointed temporary Assistant in Entomology on Rs. 75, 75-5-125 vice M. R. Ry., Y Ramachandra Rao on deputation to Pusa.

The following transfers are made in the interests of the public service :—

1. M. R. Ry., K. P. Sundara Ayyar, Farm Manager from Mangannur to Taliparamba to be in charge of Taliparamba Farm.

2. K. T. Bhandary, Assistant Farm Manager, on relief by No. 1 from Taliparamba Farm to District work in South Canara with headquarters at Mangalore.

3. C. S. Madiar, Assistant Farm Manager, to be in charge of the Coconut stations with headquarters at Kasaragod.

4. K. Govinda Nambiar, Assistant Farm Manager to remain as Assistant Farm Manager, Coconut stations, headquarters at Nileshwar.

5. M. Raman, Assistant Farm Manager from Kasaragod, to be Assistant Farm Manager Taliparamba Farm.

6. M. U. Vellodi, Assistant Agricultural Demonstrator, is posted to District work, South Malabar, headquarters Palghat.

7. K. M. Jacob, Assistant Farm Manager, on relief by No. 6, is transferred to Samalkota for farm training.

8. D. Panakala Rao, Assistant Farm Manager, Palur, is granted sick leave on medical certificate for 8 months and 24 days from 7th September 1916. This cancels the order granting him privilege leave for 1 month and 9 days from 7th September 1916 in this office.

THE JOURNAL

OF

The Madras Agricultural Students' Union.

Vol. IV.

December 1916.

No. 12.

N. B:—Contributors are requested to send in their contributions written legibly in ink on one side of the paper only.—Editor.

Editorial Notes.

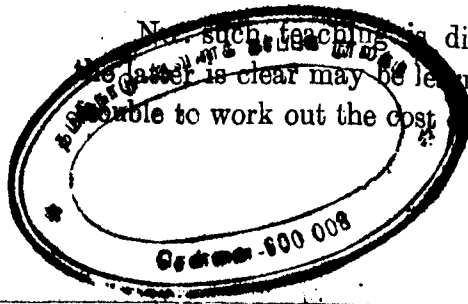
The Department of Agriculture is extending its usefulness to the ryots of the Presidency by opening four coconut farms in different parts of the Kasargod taluq of the S. Canara District. In Kasargod itself, a coconut tope of a little over 25 acres, containing about 1600 trees, mostly bearing, has been acquired, while the three others are at present waste land all of which have been fenced. The soils of these three are said to be red laterite, red loam and sandy respectively, with the purpose we believe, of testing the best suited soil for its proper growth. These farms are under the charge of Mr. Govinda Kidayu, formerly the manager of the Agricultural Farm at Taliparamba, who is so well known in all the West coast and we have no doubt that under his special charge, the farms will have a bright future. What rice is to the East coast,

Coconut
Farms.

so is coconut to the West coast, so that the opening of these farms will afford an endless opportunity to unravel the mystery that shrouds at present the cultivation of coconuts in the Presidency.

We commend to our readers, the thoughtful article by Mr. Ramachandra Aiyar on Rural Agricultural Education. The author is, of course, not by any means alone in the views he holds as to the necessity of adapting rural education to rural needs: the matter has formed the subject of endless discussions and papers in this country, in Europe and in America. The latter country, in her go-ahead style, and Germany with the thoroughness which cannot be denied her, have both attempted to solve the question, but without a very great measure of success. Books are cheap, and their use offers a great temptation to the teacher. Any one who has experience in *viva voce* teaching will testify to the mental strain it involves, especially if the class is large and the work has not been prepared before hand. These are unfortunately the necessary concomitants of such teaching. The classes will be larger than the ordinary book-taught classes, as they must have a teacher always with them, and to prepare the lessons before hand takes away much of their freshness and tempts the teacher to the continual repetition of the same lesson, irrespective of whether the subject under discussion discloses the points raised or not!

Now such teaching is difficult and expensive. That the latter is clear may be learnt by any one who takes the trouble to work out the cost of putting each student through



the short course here, for two years: the answer we venture to think will surprise him! The school of experience must be entered to appreciate the former. Mr. Ramachandra Aiyar is an enthusiast, and we like him for it. He closes his notes however, with a definite proposal which he thinks will bring about some of the changes he wishes to see. This is the appointment of an Inspector of School Gardens for the Presidency, with various duties connected with the stocking, designing and supervision of School gardens. We venture to think that such work would have to be decentralised, to be successful, and the question at once suggests itself, why not let the District Agricultural Officer do this work? It is true that he does not in most cases exist, but that he is coming is certain, and the day is not far off when we shall see every Collector provided with his expert Agricultural adviser. There has lately been some discussion about avenue planting on this district roads, and the maintenance of nurseries to supply trees for this purpose and a staff to supervise planting operations. A forest officer has been suggested, but we venture to think the Agricultural officer would be more suitable.

Whatever else may be a matter for discussion, it is certain that the average village schoolmaster has neither the inclination nor the ability to manage a school garden, and for the scheme to be successful, there must be a driving force of sufficient authority, to overcome the first, as well as a technical adviser to dispel the latter. There is no end to which the funds of the Educational Department could be more usefully employed.

We can easily imagine some ardent lover of plant life carefully bringing to our shores the plant Lantana with its beautiful flowers and scented leaves. We can further picture to ourselves his smile of satisfaction when he finds that this plant takes kindly to our climatic and soil conditions. Now, however, it is found to have become such a dangerous pest, chiefly in parts of the West coast, that the Government of India have thought it fit in the interests of the Coffee and Tea industry to depute an officer from the Madras Agricultural Department, solely for the purpose of discovering some pest to keep it down efficiently. The officer thus deputed is Mr. Y. Ramachandra Rao M. A., F. E. S., Chief Assistant to the Government Entomologist. He is deputed for 2 years to work under the Imperial Entomologist, Pusa. We understand he will travel throughout India and Burma in connection with the investigation.

We have seen a circular from the Director of Agriculture, Madras, announcing the incorporation into the Agricultural Department of what once originally formed the Pumping and Boring Section of the Department of Industries. We think that this is as it should be and the change has not come a day too soon. This has necessitated the formation of a new section under the Director of Agriculture called 'The Agricultural Engineering Section'. The personnel consists of:—

An Agricultural Engineer, Mr. F. T. T. Newland.

An Assistant Engineer, M. R. Ry., V. Rangachariar, Avl.

10 Supervisors with head-quarters at Vizagapatam, Bezwada, Madras (for Chingelput circle), Cuddalore, Tanjore, Trichinopoly, Tinnevely, Coimbatore, Vellore and Gooty.

On looking over the copy of the rules we find that special facilities will be given to the ryots in well-boring and blasting, and the erection of pumping, cotton ginning, rice-hulling and other installations.

Rural Agricultural Education.

India's prosperity lies in the field of agriculture. In general, we take to agricultural life easily enough. The geographical conditions of the country are favourable and proper agricultural education of the people can have a very pronounced effect on our general well-being. The British ever since their advent into this country have been keenly alive to our agricultural needs and offered facilities for the improvement of our primitive agricultural methods by establishing from time to time at various centres, Agricultural colleges, Farms, Research Institutes, Horticultural and Botanical gardens. The deliberation of the Famine Commission of 1878 landed the India Government in a definite policy of preparing us as an agricultural nation. By this it should not be understood that every Indian is expected to become a graduate in agriculture and should take to the cultivation of the soil only. The object is to make every Indian by a suitable training in schools in their boyhood to take an intelligent interest in the cultivation of the soil in his after life in whatever calling he may be engaged in. Every Indian is expected to take an active interest in agriculture by studying the varying methods of cultivation with the help of his early training in the schools and with the help of his superior culture in other professions; to give the ryots the benefit of his study and experience, to suggest possible improvements in many of the crude operations and also to translate to the ryots the results of experiments and demonstrations conducted by Government. Agri-

cultural Exhibitions, Associations, Cattle Shows etc., will then be truly represented by Indians for whose benefit they are intended. To attain this noble object, the India Government in all their educational despatches have been emphasising the necessity of suitable early training in schools, in nature study and school gardening so as to turn every Indian into a lover of plants and plant growth, animals and animal rearing. In this Presidency this idea of the India Government was given effect to by arranging weekly lectures in Training colleges and schools, by introducing elementary agricultural books and by introducing Elementary and Intermediate Examinations under the scheme of the Government Technical Examinations. The effect of all these have been practically nothing, owing to the misconception of the Educational Officers themselves, and of the students and people also. Responsible educationists were under the impression that these lectures, books and examinations are intended to make the school masters as experimentors and demonstrators of agriculture in their school gardens and to be also expert agricultural advisers to the surrounding ryots. If it is possible to make these school masters, Doctors and Engineers, it is possible to make them Agricultural Experts also. Of course many school masters do pose themselves as Doctors, Magicians, etc., to popularise themselves and to augment their income. I know hundreds of school masters are appearing year after year for the elementary and Intermediate Examinations in Agriculture and have myself been their examiner in some years. I do not know how a pass in these examinations covered as they are in testing the candidates' knowledge of Farm-yard manure and of the cultivation of Cholan and Paddy, qualifies him to train boys as observers, thinkers and experimentors. It is to correct this misconception that the India Government on or about the year 1902 have in clear unmistakable terms stated that all school masters should be so trained that they may in turn train the school boys in their care, as observers, thinkers and experimentors. The object of such a training should be to prepare the present school population to take an interest in the future agriculture of the country and it is the duty of the Agricultural Department to look to the present agriculture of the country. I am therefore convinced that Agricultural knowledge is of

no use to school masters. Again the so called elementary agricultural books are being misplaced in the hands of school boys. If Moore's Book on Family Medicine can be used as a text book to prepare the school final candidates as Doctors, then the teaching of agriculture as an optional subject for the school final examination is justifiable. All school masters should therefore be trained in Nature study, Horticulture, and Elementary science. Agricultural graduates with a good training in Horticulture and in Teaching would prove very good trainers of school masters of all grades. It is Horticulture that will excite the interest of children and even adults to observe. The Educational Department should insist on every school to maintain a neat and well-kept garden, however small it may be. With any collection of any rare plants, interesting and exciting lessons on nature study can be taught. A good collection of capsicums, flowers and some specimens of brinjals and maize cobs, in a neatly kept garden, will surely make children observers, thinkers and experimentors, more than all the vast fields of Cholan, Cumbu and Paddy, amidst whose surroundings the teeming millions of India are brought up. It was the observation of a careless youth that led to the great invention of steam engines and ships. An experiment with an ordinary tea-kettle to demonstrate the property of water in its gaseous state will be more interesting and useful than an elaborate lesson on the Capillarity and Porosity of bodies to the boys of the lower forms. Most of the machines and their parts are only imitations of the various parts of animals and plants. Various operations in Agriculture, Medicine and Engineering are only imitated from nature. In short all the arts, industries and professions have been the outcome of observations of nature, natural objects and their phenomena. A lesson in a school garden showing the boys ordinary plants and animals, explaining to them how the hundreds of raw materials now used in Indian homes are from either plants, animals or minerals would be more useful to an Indian boy than an elaborate lesson on soap and iron manufacture. It will be interesting to ascertain for example what percentage of the pupils of an upper secondary school can correctly assign the sources of production of such articles as Assafoetida, Camphor, Rubber, Kerosine Oil, Silk, Candle, Glue, Wool,

Musk, Incense, Enamel vessels, Glass, Indigo, Lime, Shells, Sugar, Quinine, precious stone, paper etc. A considerable number of the literary population somehow derived the queer notion that Assafoetida is coagulated blood of an animal that they could not name. Camphor is dug out of the earth, Rubber is the skin of the camel, Kerosine Oil is extracted out of some poisonous seeds, Coal is made by drying elephant skins, silk is glazed cotton etc. Would you not be surprised to hear that students of a VI form told their teacher that betel-leaves are produced by tall trees like palms. Such profound ignorance among the literates should no more be tolerated. To remove such ignorance among boys, to train them as real lovers of plants and animals, to enable them to choose their own professional studies, I beg to propose the following:—

Model School Gardens should be attached to all Government Training Colleges and Schools. All schools should be compelled to maintain small neatly kept gardens. The Science and Nature Study should be so framed that lessons on them could be taught in a school garden only and never within the four walls of the school. It is unnatural to study nature and the different phenomena of the several elements in the artificial surroundings of a school. Laboratories are intended to conduct experiments of the observations of the various phenomena in nature. Children must therefore be made to observe nature first and imitate experiments then. In their examinations of plants and animals the teacher should indicate to the students nothing more than the Vernacular names they bear and the economic purposes which they subserve and allow them to find out the rest of the details for themselves gradually. The organic or the inorganic origins of the hundreds of raw materials in daily use in our homes should be explained by a reference to the plants, animals and minerals themselves as far as possible and to their pictures where they cannot exist in the locality and steps should be taken that all these are in constant view of the boys. Lessons on the properties of solids, liquids and gases and of all the mechanical powers must be given in the garden itself with illustrations chosen from the objects or phenomena occurring there. All the geometrical shapes and their

measurements could be taught entirely in the school gardens. A lesson in a school garden on the various methods by which plants protect themselves from their enemies would be more interesting than one in a school room on Nitro-Bacteria. An illustrated lesson as to how different climbers adapt themselves to climb over supports would be more suited to the age and comprehension of the boys, than a dictation of elaborate notes on the classification of soils and the methods of cultivating Chulam, and Tobacco for getting them by heart.

Examinations should not be conducted on paper but only in school gardens. If a school boy is able to separate sand, clay and the organic matter in the soil, even though he does not know the various ingredients and if a boy without knowing the definitions of capillarity and porosity shows, however, how water rises if a lump of clay is held over a basin of water just touching it, I would consider these for instance good scientists. In these ways the boys should be introduced to scientific habits of the study about plants, animals minerals, the properties of solids, liquids, and gases, and the mechanical powers and of Chemistry, Geometry, and mensuration.

To do this agricultural graduates with special training in horticulture, nature study, elementary science and teaching should be appointed to all training schools and colleges with prospects of rising as Sub-Assistant Inspectors of schools. They should be in charge of Model school gardens equipped with all facilities for teaching elementary botany, zoology, physics, geometry and mensuration. School gardens should be attractive and interesting by growing in it specimens of cereals, pulses, flowers, vegetables and all other economic and ornamental plants as far as possible.

One Inspector of school gardens for the whole Presidency should be appointed, whose duties shall be.

- (1) To be in charge of a central nursery, model garden and seed-store.
- (2) To distribute seeds and plants to all school gardens.
- (3) To prepare plans and give estimates to school gardens.

- (4) To train teachers in Horticulture etc.,
- (5) To supervise the working of the school garden etc.,
- (6) To conduct school garden shows.

S. RAMACHANDRA AIYAR.

Sugarcane crop, its past, present and future in relation to Noyyal valley.

(Continued from page 274 of November Issue.)

Milling and boiling Jaggery. About 30 years ago, the ryots were making use of a wooden mill for crushing cane. By this a large portion of the juice was being left unextracted in the megass. But in about 1880 an iron mill was said to be introduced at the initiative of the Government. The ryots soon came to realise the advantages of the iron mill. Now the iron mill is in general use for crushing and the wooden mill of the past cannot be had even for having a look at. The hearth now used for boiling jaggery is defective in some points, owing to which the ryot has to spend extra on fuel for boiling juice. The only changes that are now desirable in the furnace are (1) to provide a grate under the furnace for allowing the ash to pass through, lest it should collect and smother the fire. (2) To provide an ash chamber immediately below the grate to receive the ash, which can be taken off through a tunnel or vent in the ash chamber. The latter vent will also serve to set up a continuous draft of air to the fire.

Small quantities of lime are added to juice to neutralise its acidity. But enough attention is not paid for removing the scum. Their contention is that scum gives jaggery a colour which consumers prefer. The daily outturn from an iron mill and a pan is about 500 lbs. or 2 pothies, got in 5 boilings of 4 maunds each. The milling of canes from an acre of land takes about 15 to 20 days when the working hours are more than 16 to 18 hours per day. The milling and boiling is a very tedious and hard work. Often the canes cut the previous evening are delayed milling for some cause or other, such as want of labour, or cattle and

this is attended with loss of sugar. This iron mill itself does not extract as much juice from canes as power driven mills. With a view to demonstrate to ryots, how more economically and speedily the milling and boiling of jaggery can be made, the Department of Industries have installed a power driven crushing mill at Singanallur at a cost of Rs. 10,000. The mill actually crushes $1\frac{1}{2}$ tons of cane in one hour or 16 tons of cane in a working day of 12 hours which is equal to the produce from half an acre under Singanallur conditions. What would take 15 or 20 days to mill under the native method, would be finished in 2 days by this power driven crushing mill. The crushing station is also provided with 3 sets of pans placed over furnaces so constructed that the maximum of heat is utilised and the wastage of heat is reduced to a minimum. Here therefore the trash and megass are absolutely enough for boiling jaggery and the extra fuel need not be bought. During the 3 to $3\frac{1}{2}$ months which form the milling season the plant can crush, if daily worked, the produce from 50 to 60 acres. The ryots who are nearest to the crushing station and such of them as have the advantage of a road or a cart track avail themselves of the benefits of this plant. But the larger number of cane fields are situated out of the way where there is neither road nor cart track. Carrying canes by head-loads would not be worth the ryot's while to do. So it is only a few who are benefited by this installation. The ryots are charged Rs. 3 per pothi of jaggery produced here. In actual working, the outturn of jaggery per day is 9 pothies or one ton equivalent to about 9 tons of cane. But the crushing plant is capable of crushing 16 tons of canes if worked without the least interruption in a day of 12 hours. The receipts per day of crushing station are Rs. 27 at Rs. 3 per pothi on 9 pothies; and the daily expenses during the season are Rs. 11 (for labour and oil). So the total balance at the end of milling season will be Rs. $16 \times 105 \text{ days} = 1680$ rupees. The station has to be closed for the remaining part of the year for want of work. The receipts are therefore just or hardly sufficient to meet the interest on capital, depreciation in machinery, and other expenses of the station. But the demonstrational value of the installation is great. The one or two things that struck me on a visit to this station are:—

(1) That the charge of Rs. 3 per pothi of jaggery produced should be reduced to Rs. 2 for 2 or 3 years until the ryots became accustomed to the change from their traditional method of milling.

(2) The sets of boiling pans to be raised from 3 to 5 as the crushing plant is capable of crushing more cane than the three sets of pans can deal with.

(3) The ryots must be instructed to form an understanding between them as to the time for cutting and carting canes to the station, as otherwise, there will either be too much or too little of cane delivered in the same day.

(4) Management of crushing station should be in the hands of the the Agricultural Department rather than the Department of Industries. The manager of the crushing station must be in close touch and sympathy with the ryots, to ensure the success of the station.

Conclusion. The future of the sugarcane crop in any particular locality is inseparably bound up with India's future as a sugar-producing country. The influx of cheap sugars from other countries has given a set back to the sugarcane cultivation in the whole of India. Even when the stimulus given to sugar production in some countries by bounties be withdrawn, which is bound to come to pass sooner or later, the cost of production will be the main genuine factor in the sugar market. Those who have worked out the question say that the cost of production of sugar in India is double of what it is in Java and other cane producing countries. The question of reducing the cost of production becomes therefore a question of the first and primary importance. This, I expect can be done in the following ways:—

(1) By adoption of a more intensive cultivation (Deep tillage and more thorough after-cultivation).

(2) Better manuring. Application of more manure given in a larger number of dressings. Green manuring must form part of the preliminary manuring.

(3) Economy in cost of cultivation:—

(a) Use of tops for sets instead of cuttings from whole canes.

(b) Use of wire netting in place of thorny fence.

(4) By avoiding wastage of sugar by deterioration as the result of delay between cutting and milling of canes or between milling and boiling. Adoption of power driven crushing mills on a co-operative basis is a point worth considering.

(5) Use of up to date furnaces by which maximum quantity of heat is utilised.

(6) Extension of sugarcane cultivation. This will take place by itself when cane growing becomes more paying.

(7) By importing or evolving new varieties of canes suitable to different localities and capable of giving more sugar per acre. With this object in view a cane breeding station has recently been opened which promises to do a great deal to the future sugar production in India.

All the above ways, severally and jointly may contribute to reduce the cost of production of the raw material. Then there is the demand in India for 600,000 tons of sugar which is now imported. To meet this demand sugar has to be manufactured in India. The one great hinderance to the realisation of central sugar factories is the cultivation of cane in small areas scattered over a tract. The deterioration of cane in the course of carriage from long distances to the factory will result in loss. To avoid this, Mr. George Martineau suggests in page 303 of International Sugar Journal Vol. XIII, 1911, the use of 'Fryer's Concretor' the trial of which he thinks to be the most likely line of policy to bring about practical results. He says that "canes cannot be carried long distances especially in tropical climates, but Fryer's concrete can go anywhere." He describes the concretor to be a very simple inexpensive and easily worked contrivance by which the cane juice can be converted into solid mass, this concrete will be just like jaggery only clean instead of dirty, brighter yellow instead of black and

as sweet and pure as honey; that the process of manufacture would be very simple without any elaborate arrangements of evaporation and vacuum pans, and the result would be exactly suited to the exigencies of Indian conditions; that the working of the Fryer's concretor can be done by a few intelligent men competent to work the few necessary bits of machinery. That the concrete produced will be a purer substitute for jaggery both for native consumption or factory purposes. This 'Concretor' is therefore worth a trial. If it should serve all the purposes better than jaggery then it would be worth having. Then a central factory will be able to deal with all cane within easy reach and obtain the so called "Concrete" from long distances. The one obstacle in the way of sugar factories will be successfully met with if this concrete could be done with small expense and trouble.

The sugarcane cultivation is at present threatened and is on the decrease for reasons already given. It seems to me quite possible to resuscitate the sugarcane cultivation by the ways detailed above.

It also appears to me the goal will be sooner reached if the cheap sugars are stopped by import duties until India has made sufficient advance in sugar production methods and if experimental factories or subsidized factories are opened in more suitable localities as a beginning.

M. MANGESA RAO.

Correspondence.

To

THE EDITOR,

JOURNAL OF THE

MADRAS AGRICULTURAL STUDENTS' UNION,

COIMBATORE.

Sir,

Your correspondent, "a member" accuses me of holding the *western* idea that it is better to spend too fast than too slow. I regret I did not make myself clearer. I endeavoured in my original contribution to emphasize the fact that the Union was not at

present justifying its existence, and that to do so, it must extend its activities. If such an increased programme implied the spending of money, the Union—I tried to point out—must face the fact and spend it. If it did not imply any expenditure, there was no ground for the Union to continue collecting subscriptions and accumulating reserves. I cannot see that there can be two opinions about this, and discussion is more likely to centre round the particular direction or directions in which the Union can increase its usefulness. "A member" suggests increasing the attractiveness of the Journal, and I think we should most of us agree, though as for his proposal to lock up a large sum of money in a building, there is not so much to be said, and I doubt if he will for this obtain so many supporters. More suggestions are wanted, so that the matter can be thoroughly discussed at the meeting next year.

I am, Sir,

Yours etc.,

"Hustle."

All members of the Union should welcome the contribution by "Hustle" in the August issue of the journal, offering constructive criticisms on the lines on which the Union might develop its work in future.

2. To the suggestions made by "Hustle" in his contribution some of which may be generally acceptable and some not, many more may be added, e. g.,

(a) Purchase of a Printing Press, so that the printing of the Journal may be done on the estate and the Journal published more punctually than hitherto. Job work may also be undertaken.

(b) Award of a medal for the best all round man in the senior course. There are prizes so far for Agriculture and

Chemistry, and there is no prize for the Licentiate in Agriculture who secures the highest number of marks in the final Diploma Examination.

(c) Awarding of a prize for the best managed Home Farm of those members who take to private farming—the judging to be done by the Director, Deputy Directors and Assistant Directors of Agriculture.

(d) Awarding of prizes to those student-members who maintain a good garden round their hostel blocks.

(e) Making an allotment to the officers' club for the improvement of their library or games section.

3. Before considering the various suggestions mentioned above and those made by "Hustle," most, if not all, of which aim at spending away the Reserve Funds of the Students' Union, it is perhaps best to direct our attention to the Reserve Fund itself. A close scrutiny of the rules of the Union does not show that there is a provision for creating a Reserve Fund and how that Fund is to be utilised. The annual Reports, however, divided the finances of the club into (a) Permanent Fund, (b) College Day account and (c) Journal account; and as these financial statements have apparently been passed by the general body of the Union, we presume that the Permanent Reserve Fund has been recognised by the Union and that the College Day celebrations and the conducting of the Journal should be self-supporting. This Fund and the interest thereon have been helpful in meeting deficits in College Day and Journal accounts in previous years, in making advances for the same and recently in awarding a scholarship to a student of the college. As every attempt is made every year to make the College Day and Journal self-supporting, and as the Permanent Fund is made up of donations and life subscriptions, it follows that the Permanent Fund must increase year after year. It becomes also necessary now for the Union to

decide whether *the fund itself or the interest thereon* should be drawn upon in any future schemes of improvement in its work.

4. Very few of the members would object to the utilisation of the interest accruing year after year, but every one will hesitate before voting for the utilisation of the Permanent Fund. This amount has been piled up slowly and we may or may not be able to collect as well in future and there is the possibility of our repenting later if we follow the advice of "Hustle" that it is better to spend too fast than too slow. The Fund has to be considered, more or less, as an endowment and no one thinks of using up endowment capital. The award of a scholarship, on the lines already undertaken by the Committee, is, however, correctly speaking, a loan granted on the security of a Life Policy coupled with personal or other surety at 6% interest; and, in granting loans out of the Endowment Fund, we only change our investment from one form to another. The money is absolutely safe and when repaid, is useful again for a similar purpose over and over again.

5. Whatever suggestions may be accepted by the general body of the Union, the following guiding principles may be had in view:—

1. Permanent Reserve Fund should be recognised.
2. The interest thereon may be used up year after year in awarding prizes or medals.
3. Scholarships on the repayable system may be granted out of the Permanent Fund.

6. Before closing, I might invite the attention of the readers to the fact that some years ago, the Zemindars of Madras collected money for the institution of a scholarship—to be called Lawley Scholarship—for award to agricultural students, and

if the committee makes serious proposals, it is not unreasonable to expect that the endowment of the Zemindars may be handed to the Union which is now thoroughly recognised everywhere, for being administered by that body. Rather than use up the Fund in a number of ways, the system of scholarships should be persevered in, as it will benefit present and past students.

An old Student.

Notes.

Coconut fibre :—Enormous quantity of coconut fibre yarns and ropes made out of it are annually exported from the West Coast. The export figures had come almost to a climax, just before the beginning of the Great War. It is proposed to deal in this note with the fibre only.

The process of fibre extraction is very simple. Fresh pericarp of the coconuts, as soon as they are husked green, are carted and soaked along river banks often a little away from the river where it is miry and salt water gets in.

Pits about 9' by 9' and about 6' deep are made; each such pit holds the pericarp of 1000 nuts. About a foot of earth is put at the tops of the pericarp. The sides and tops of the pit are lined with coconut leaf mats. The retting and extraction of fibre go on from September to the next May, in some parts all round the year. The colour of the fibre and retting depend very much on the nature of the soil in which the fibre is buried. The water which gets in must be brackish. If the soil be very clayey and black, the fibre becomes black and dirty. If too sandy, retting takes too much time and there is wastage in fibre. The soil must therefore be more or less loamy. Under ordinary conditions it takes about 6 to 8 months for the pericarps to rot properly. The pericarps are removed, washed and beaten with wooden sticks about 1½' long. Palmyra stem which is heavy and hard is also much

used for this purpose. The beaten fibre is then dried in the sun. Dried pericarp is never soaked.

The pericarp of 3000 nuts are required to obtain 1 candy of fibre. One fibre candy at Tellicherry is $36 \times 20 = 720$ lb. So much is reckoned. 640 lb in big firms; probably 80 lb is a set off for dirt and imperfect drying.

Expenses of making a candy of fibre are given below. The price of 1 candy of fibre was as high as Rs. 40—50 before the war. It has much gone down now.

There are different grades of fibre. Gold coloured—without husk particles, is considered the best. Next is white, which changes to dirty white. Blue or black is the worst. If the pericarp is fresh when soaked and retting is done in suitable loamy soil and it is taken out in time and beaten, good fibre is invariably obtained. If the nut is too well matured and the husk changed colour as a consequence, the fibre becomes unsatisfactory.

	Rs.	A.	P.
The price of 3000 pericarps at 7½ Rs. per 1000	22	8	0
Cost of carting	2	4	0
Making pits and soaking	0	12	0
Coconut leaves etc., for pits	0	12	0
Taking out the pericarp, at 12 as. per 1000 ...	2	4	0
Expenses of beating and taking out the } fibre at 2½ as., per 100 (contract rate). }	4	11	0
Drying, packing etc.,	1	0	0
Total Rs.	34	3	0

The price per candy is Rs. 40 — Rs. 50.

M. G. K.

Correlative Characters in the Rice plant :—(Some of the results obtained in the Phillipines). The period of time required to mature a crop of rice, if not less than 120 days nor more than 180

days, does not have any appreciable effect on yield of grain, if growth takes place under normal conditions.

For varieties which take less than 120 days to mature, any extra early maturity is to be had only at the expense of yield. Very late maturity affords too many opportunities for unfavourable weather conditions, diseases and pests to injure the plants and thus lower the yield of grain. In paddy, tillering, the number of grains per panicle, and grain or seed size, are elastic or compensating characters and each in turn is affected by the one preceeding it and the development of the character is extended or curtailed as the case may be, by the prevalent environmental conditions and is based upon the extent of the development of the preceeding character.

In passing judgment on a variety, the number of tillers per unit of area, the average number of grains per panicle, and the net kernel weight and volumetric measurement must be accurately determined.

The height of plants has noteworthy influence on yield. If the straw length is less than 1·5 meters, the yield per hectare (2·47 acres) diminishes as the average straw length becomes shorter. The number of grains per panicle has no influence on yield. The number of grains for a variety is dependent on the tillering habit, the grain dimensions and density.

The number of grains borne on the panicle is an elastic or compensating character. If a variety has an unusually large number of grains per panicle, it is quite probable also that it is late maturing.

The real aim of the plant breeder must be to approximate excellence in all essential features. The superlative may be the aim but experience shows that this degree is usually attained only at the cost of some highly desired character. Most of the characters

of the rice plant vary considerably and to some extent independently of the other characters, but when the combination of these several characters is effected, each in a moderate degree, the highest consistent yield of grain will result. (Phillipine Agricultural review).
K. R.

Cause of yellow colour in maturation:—As the seeds develop, most part of the substance of the plant including mineral elements becomes concentrated in the seeds. Of these minerals, magnesium is one which in common with phosphorous and sulphur accumulates in the largest quantities, up to 50%. Magnesium, however, of all the elements, is the only mineral present in chlorophyll. The migration and fixation of this element in the seeds, therefore, must cause the disintegration of a considerable portion of the chlorophyll or the prevention of the regeneration of chlorophyll. The result is yellow colouration of the leaves. M. R. R.

Drainage:—One of the practical and successful systems of drainage which can be recommended for trial on saline lands for getting rid of salts or on stiff clay lands for improving their drainage is noted below.

“Dig drains across the natural drainage of the land 2½ feet deep and fill the same with twigs of Babool (*Acacia arabica* *Tam Karuvel marum*), etc. up to about 6 inches from the surface and then cover the drains. These small drains to be connected with the main drains, which should be about 6 inches deeper. The distance between the small drains to be about 20 feet and that between the main drains to be 80 feet apart.”
Bombay Bulletin No. 39.—K. K. R.

Harvesting by machinery at Hagari Agricultural Station:—
17 acres of Fodder cholam which was in a fit state to be cut, was

harvested with the Mc Cormick's Vertical Mower. It may be mentioned here that this is the first year in which a regular use of this mower was attempted and but for the interruptions caused by the weather conditions combined with some trouble with the lever arm of this machine which broke 5 times during the course of the work and had to be repaired, it would have been possible to record in this report facts and figures in respect of the working cost of this machine. However it is clear from the short experience gained, that the use of this machine economises a good deal of time at a period when labour is not quite so cheap to procure to harvest large areas within a limited period at the disposal of the farmer.—Progress Report of the Hagari Agricultural Station for the month of October 1916.

Paddy fields lying in the valleys round Parlakimidi which are liable to inundation by floods during times of heavy rains are always broad-casted but never transplanted. Excessive seed-rate, 120-150 pounds per acre is broad-casted in well prepared and heavily manured fields with the help of the first showers of the south-west monsoon, early in June. After the crop is about 6 weeks old when plenty of water is available, the fields are flooded and ploughed round and round in a continuous line starting on the margins of the fields and finishing in the centre as is done in transplanting *Ganti* (Cumbu) and dry *Chodi* (Ragi). Then the levelling board is passed and water allowed to remain to a depth of 5 to 6 inches for 3 days and then drained off. The paddy plants then show their heads up while all the weeds and the uprooted plants rot. This operation is an excuse for weeding, thinning, interculturing, and what not. The ryots give the following reasons for adopting this practice :—

1. The rainfall is not certain and sufficient water for puddling and preparing fields for transplanting is not available when needed.

2. During times of heavy rains water flows in torrents over the fields when, transplants are more easily washed off than plants which have already had a better footing in the ground.

3. Labour is not available at that time of the year and even if available exorbitant wages in kind have to be paid.
(A. D. N. D's June Monthly Report). G. N. R.

Estate Notes.

Officers Club :—On Friday the 24th November 1916, the Officers' Club had the privilege of hearing a most interesting talk about "the Rubbish-heaps of Egypt, or a sheaf of ancient letters unearthed" by Rev. Dr. Moulton D.D. Holding the chair of comparative philology in the University of Manchester he is a great scholar in classical literature and has done much original work in deciphering and translating ancient greek letters etc., unearthed by investigators in Egypt.

Egypt is an almost rainless country and any dry material such as scraps of papyrus or potsherds—both of which seem to have served the purpose of note-paper in those days thrown away by people in ancient times along with sweepings became soon covered over and in due course buried deep by sifting sand and thus became admirably preserved. Such old rubbish-heaps, the sites of which are easily located after some experience, were found to contain papyrus scraps and bits of broken pottery in an almost fresh condition. Strips of such papyrus letters were also found in the interior of mummified sacred crocodiles. These letters were invariably written in Greek which was the language of the majority of the people in Egypt between about 300 B. C. and 200 A. D., and as they represented the correspondence between not very literate people, the language used in these letters was not of the finest and was indeed usually

full of mistakes. The great point about them, however, is the fact that they teem with human interest. As instances may be mentioned a letter from a profligate and disowned son to his mother professing bitter repentance and praying to be taken back, a second full of reproach from an uncared for and suffering wife to her selfish husband who has apparently on account of poverty taken refuge in a cerapium or a temple under profession of fulfilling a vow, and a third—with touches here and there of stinging sarcasm—from the pen of a much-petted son—evidently the tyrant of the family, addressed to a father, who obviously to escape from the petty tyranny of the little despot had decamped on board a boat to enjoy a short respite. All these echoing, as they do, incidents of everyday occurrence even at the present time, remind us with peculiar emphasis, that, in spite of the lapse of numerous centuries, in spite of the enormous changes that have taken place in the interim and in spite of differences of caste, race or creed, human nature in its failings, as in its merits, has always remained and probably will ever remain, unaltered and unalterable.

Departmental Notes.

1. Mr. John A. Muliyl, B. A., is appointed to act as Assistant in Entomology on Rs. 75, 75, 75—5—125, in the vacancy caused by the deputation of Mr. E. Ballard, on Military duty.
2. M. R. Ry., P. S. Jivanna Rao, is granted Privilege leave for three months from or after the 2nd January 1917.
3. Assistant Farm Manager, M. R. Ry., D. Panakala Rao to be Assistant Farm Manager, Sugarcane Station on return from Privilege leave on 3rd January 1917.
4. M. R. Ry., V. S. Ramaswami Ayyar, Assistant Farm Manager, Sugarcane Station, is granted two months Privilege leave from date of relief by D. Panakala Rao.
5. M. R. Ry., T. Lakshmana Rao, Assistant in Chemistry, is granted extension of Privilege leave for 27 days in continuation of 6 weeks Privilege leave already sanctioned.

The Madras Agricultural Students' Union,
Agricultural College, Lawley Road, P. O.,
Coimbatore, 26th. June 1916.

DEAR SIR,

The Working committee has great pleasure in inviting you to this years' College day and Conference to be held from the 15th to 18th July 1916.

The suggestions regarding the amendments to the rules of the Union received by the General Secretary have already been published in the March issue of the Journal. These will have to be first discussed at the Business Meeting before they are placed before the Annual General Meeting.

From the list of names (Nos. 89 to 218) of Mofussil ex-student Members, you are requested to select 10 names for Council Membership—Of these, 3 may be elected as Vice-Presidents. It is the opinion of the Committee that these mofussil members of the Council may be elected to represent Saidapet and Coimbatore ex-students on the one hand and different localities on the other.

The expenses incurred by the Union in connection with the College day exceed Rs. 400/- and the Committee confidently hopes to receive, as usual, liberal contributions towards the success of the College day and Conference. The committee requests you to send in your contributions to the General Secretary at an early date.

The Warden of the Students' Hostel has kindly consented to arrange for the boarding at Re. 1/- per diem during the conference and it will greatly facilitate arrangements if you could let me know in good time the date of your arrival.

Awaiting the favour of an early reply,

I remain,
Dear Sir,
Yours sincerely,

(Sd.) K. KRISHNAMURTI RAO.
General Secretary.

Members of .
The Madras Agricultural Students' Union.

Corrected up to 10th June 1916.

Honorary Members.

	Rs.
1. Abraham Pandithar, M. Rao Sahib.	50
2. Annaswami Thevar, A. Rao Bahadur.	15
3. Anstead, R. D., B. Sc.	
4. Audinarayana Rao, M., Dewan Bahadur.	
5. Barber, C. A., M. A., F. L. S., Sc. D.	
6. Ballard, E.	
7. Benson, C., M. R. A. C.	
8. Chadwick, D. T., M. A., I. C. S.	30
9. Chatterton, A., C. I. E.	
10. Carruth, A.	
11. Coleman, L. C., Ph. D.	
12. Couchman, M. E., I. C. S.	25
13. Fletcher, T. Bainbridge, F. E. S., F. Z. S., S. R. N.	10
14. Gangaraju Pantulu, M.	15
15. Harrison, W. H., D. Sc.	
16. Hilson, G. R., B. Sc.	
17. Kalinga Rayar, R., Dewan Bahadur.	25
18. Kasimkotta, Zamindar of	25
19. Keess, W., M. A., M. R. A. C.	
20. Kenny, John.	
21. Krishnaswamy Ayyengar, N., B. A., B. L., Rao Bahadur.	15
22. Kunjan Pillai, N., M. A., B. Sc., Ph. D.	
23. Lonsdale, J. M.	
24. Manavedan Rajah, K. C., Rajah, B. A.	
25. McRae, W., M. A., B. Sc., F. L. S.	
26. Metha, G. A. D., L. Ag., N. D. D.	
27. Narayana Rao, K., B. A., B. L., Dewan Bahadur.	15
28. Nicholson, Sir. F. A.	50
29. Parnell, F. R., B. A.	

3.

30. Pattabirama Rao, N., B. A.	
31. Ramabhadra Nayudu, V., Hon'ble, Dewan Bahadur.	15
32. Ramalinga Chettiar, T. A., B. A., B. L.	
33. Raman Menon, I., B. A., F. E. S.	
34. Ramasastrulu Nayudu, K. R., B. Sc.	
35. Raman Unni Valia Nayar, Rao Sahib.	30
36. Rangachariar, K., M. A., L. T., Rai Bahadur.	10
37. Robertson, F. W. R., I. C. S.	
38. Sampson, H. C., B. Sc.	
39. Seenam Bhat, J. Rao Sahib.	
40. Shepperson, C. W. J., B. Sc.	
41. Shanmugam Pillai, S. T.	
42. Southern, H., B. A.	
43. Sreenivasam Pillai, K. S., Rao Bahadur.	15
44. Stuart, G. A. D., I. C. S.	
45. Subba Rao, N., Rao Bahadur.	
46. Subramania Ayyar, Sir. S., B. L., K. C. I. E. Dewan Bahadur.	50
47. Subaraya Ayyar, P., B. A., Rao Bahadur.	10
48. Swamikannu Pillai, L. D., M. A., B. L., (Madras) L. L. B. (London) Hon'ble Dewan Bahadur.	
49. Thomas Roger, B. Sc.	
50. Venkatachari, C.	
51. Vasudeva Rajah, Valia Nambidi, Rajah.	25
52. Wood, R. C., M. A.	
53. Yegyanarayana Ayyar, A. K., M. A., (Madras and Cantab).	5

Patrons.

54. The Hon'ble Mr. Moopil Nayar, Kavalapara.	100
55. Zamindar of Parlakimidi.	100

Associates.

56. Kapila Ramdas Pantulu Garu.	10
57. Dhanappa Pillai.	2

Members residing on the Estate.

(Ex-Student and Officer Members.)

First Class Members. Subscription Rs. 10.

58. Alwa, K. T., L. Ag.
59. Ananda Rao, D., B. Sc.
60. Ramaswami Sivan, M. R., B. A., D. A.
61. Ranganath, T. R., L. Ag.
62. Tadulinga Mudaliar, C., F. L. S.

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63. Azizudeen Sahib, Mahammad, T. S., D. A.
64. Cherian Jacob, K., L. Ag.
65. Jeevan Rao, P. S., B. A.
66. Krishnamurti Rao, K., D. A.
67. Lakshmana Rao, T., B. A.
68. Mangesha Rao, M., D. A.
69. Nath, B. V., F. C. S.
70. Narayanayyar, C., D. A.
71. Natesayyar, L. S., D. A.
72. Narayanaswami Ayyar, V. S., D. A.
73. Narayana Rao, T. V., D. A.
74. Raghavachari, K., L. Ag.
75. Raghunathaswami Ayyangar, P. A., D. A.
76. Ramachandra Rao, Y., M. A.
77. Ramiah, K., L. Ag.
78. Ramanujachari, K., L. Ag.
79. Raghavendra Rao, P. V., D. A.
80. Rangaswami Ayyangar, G. N., B. A.
81. Sankaranarayanayyar, K.
82. Seshachari, C. V., L. Ag.
83. Subramania Ayyar, S., D. A.
84. Sundararamayyar, S., M. A.
85. Venkataramayyar, T. S., B. A.
86. Venkataramayyar, T. S., D. A.
87. Venkatakrishna Mudaliar, S., B. A.
88. Vital Rao, U., L. Ag.

Mofussil Ex-Student Members.

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| 91. Kochu Kunjunni Achan, P., L. Ag. | 50 |
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97. Eapen George, M., L. Ag.
98. Kochu Govinda Marar,
99. Govinda Kidavu, M., D. A.
100. Gurunada Pillai, V. S.
101. Hayavadana Rao, K. R.
102. Iswaran Pillai, I. C.
103. Mahammad Abdur Rahim, P. N.
104. Muthayya, M., L. Ag.
105. Narayana Rao, D. L.
106. Panchapakesa Ayyar, M., D. A.
107. Parameswarayyar, M., D. A.
108. Patuck, N. H.
109. Ranga Raju, J. R.
110. Rama Rao, A., Rao Sahib.
111. Ramaswami Ayyar, R., D. A.
112. Ranga Reddy, C.
113. Ratnaji Row, V., L. Ag.
114. Sankarayyar, M. S.
115. Sankunni Menon, K. P., L. Ag.
116. Sethuramayyar, A., Rai Sahib.
117. Siva Rao Badami, L. Ag.

118. Srinivasa Rao, H.
119. Subramania Mudaliar, V. P., G. B. V. C.
120. Sundaresa Ayyar, M.
121. Venkata Rao Badami, L. Ag.

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122. Anantharama Sastry, S.
123. Audinarayana Chetty, B.
124. Audinarayana Rao, K.
125. Babu Rao, S., D. A.
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127. Bhaskarayyar, C.
128. Bhandary, K. T., L. Ag.
129. Budhavidaya Rao, T., L. Ag.
130. Chandrasekara Mudaliar, A. R.
131. Chinnathambi Pillai, A., L. Ag.
132. Daniell, S., L. Ag.
133. Dhanakoti Raju, V. G., D. A.
134. Dwarakanath, B., L. Ag.
135. Ellappa Chetty, C., L. Ag.
136. Ganapathisundaram, T. S.
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139. Gopalaswami Mudaliar, S.
140. Gopalakrishna Raju, L. Ag.
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147. Kesava Pillai, N., L. Ag.
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150. Krishnayyar, T. A., L. Ag.
151. Krishnan, P. G., D. A.
152. Krishnaswami Ayyar, K. V.

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155. Madhava Rao, B.
156. Madiah, C. S., L. Ag.
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158. Manicka Mudalir, V., L. Ag.
159. Manga Razu, L. Ag.
160. Muthuswami Ayyar, V., D. A.
161. Narayana Ayyangar, K., D. A.
162. Narasinga Razu, C., L. Ag.
163. Narayana Ayyar, K., L. Ag.
164. Narayanayyah, S., L. Ag.
165. Narayana Rao, B. V., D. A.
166. Panakal Rao, D., L. Ag.
167. Parathasarathy, B. K.
168. Paramanandam, T., L. Ag.
169. Pranatartiharayyar, S., L. Ag.
170. Pundit, R. P.
171. Raghavachari, W., D. A.
172. Raghavayyengar, S., D. A.
173. Rajagopalachari, T. V., D. A.
174. Rajagopal Nayudu, G.
175. Ramalinga Vadhiyar, C. S., D. A.
176. Ramanadhaiyyar.
177. Ramaswami Pillai, S., D. A.
178. Ramaswami Ayyar, T. S., L. Ag.
179. Saldanha Isidore.
180. Sambasiva Ayyar, T. S.
181. Sankarayyer, K., D. A.
182. Sankaranarayanan, K. R.
183. Sankarakumar, L. Ag.
184. Sankaran Nair, Kunhi, L. Ag.
185. Sadagopayyengar, N., L. Ag.
186. Sitharama Patrudu, L. Ag.
187. Sivaramakrishnayyar, N., L. Ag.
188. Sivarama Rao, D. B., L. Ag.
189. Siva Rao, Bhairy, L. Ag.

190. Sitharam Chetty, M., L. Ag.
191. Sivarama Pillai, G.
192. Srikantiah, S. V.
193. Srinivasachari, N. R.
194. Srinivasa Charlu, T. V.
195. Sriramulu Pantulu, R.
196. Sriramulu, K.
197. Subramania Ayyar, C. S.
198. Subramania Ayyar, A. K., L. M. E.
199. Subramania Ayyar, R.
200. Subramania Ayyar, P. S., L. Ag.
201. Subramania Ayyar, T. V.
202. Subramania Kandar, P.
203. Subramania Sastri, V. S., D. A.
204. Sundara Ayyar, K. P., L. Ag.
205. Sundararamayyar, K.
206. Tilloo, K. B., D. A.
207. Thirumuruganadham Pillai, A. V., D. A.
208. Unnikrishna Menon, K., D. A.
209. Vaidhyanadhayyar, K.
210. Veeraraghava Rao, L. Ag.
211. Venkaswami Rao, T. R., D. A.
212. Vellodi, M. U., L. Ag.
213. Venkataramayyar, D. K.
214. Venkataramayyar, P. S.
215. Venkataramiah, R.
216. Venkuswami Ayyar, P. S., L. Ag.
217. Vijayaraghavachari, V.
218. Viswanathayyar, N. V., L. Ag.

**Ex-Student Members who have not paid their
Subscriptions in full.**

(Caution money not yet adjusted).

First Class Members.

	Paid Rs.
219. Ahmed Hussain.	1
220. Nilakantayyar, A. S.	2
221. Rangaswami Ayyangar, E. N.	1
222. Sitharamayyar, K.	1
223. Srinivasayyengar, N.	2
224. Subba Rao Nayudu, K.	5
225. Venkatachalam, M.	1

Ordinary Members.

226. Achuthan Nambiar, K.	4
227. Anantharamayyar, T. G.	1
228. Arulanandam Pillai, C.	1
229. Balakrishnayyar, M. A., L. Ag.	2
230. Doraswami Ayyangar, G., L. Ag.	2
231. Ganeshayyar, A. K.	1
232. Gopalakrishna Paul, M.	2
233. Govindan Nambiar, K.	1
234. Jacob, K. M., L. Ag.	3
235. Krishnaswami Pillai, K.	1
236. Kunhappa Nambiar, E., L. Ag.	3
237. Kunnukutti, M. P.	2
238. Kuriyan, P. K.	2
239. Lakshmipathi Rao, T.	2
240. Narasimhachari, L., L. Ag.	2
241. Paramanayagam Asari, K. S.	1
242. Rajagopalayyar, T. K.	1
243. Ramanadhayyar, V., L. Ag.	3
244. Ramalingayya, A.	1
245. Rangaswami Ayyangar, T. A.	1
246. Rangaswami Pillai, K.	1
247. Sanjivi Rao, K. N.	2
248. Sankunni Menon, K.	1
249. Sankaran Pillai, K. S., L. Ag.	3

250.	Sinnappa Tolar, B.	2
251.	Sitharamayyar, G.	2
252.	Srinivasayyengar, C. R., L. Ag.	3
253.	Subramania Ayyar, S.	1
254.	Subbayyar, S., D. A.	3
255.	Surya Narayana Sankarapalli.	2
256.	Swami Rao, R., L. Ag.	3
257.	Venkobachar, A.	3
258.	Venugopalayyah, U. V.	2
259.	Veeravarada Razu, S.	2
260.	Veeraswami, B., L. Ag.	3
261.	Vridhachalam Pillai, U.	3
262.	Vyasarajan, C. P., L. Ag.	4
263.	Yesudasan, A., L. Ag.	3

Student Members.

Ordinary Members. (Rs 5).

Class III.

264.	Chakrapani Marar, K. W.	2
265.	Dharmalinga Mudaliar, S.	1
266.	Govinda Poi, K.	1
267.	Kuppuswami Ayyangar, S.	1
268.	Ramachandra Ayyar, V.	2
269.	Ramaswami Ayyar, C. V.	2
270.	Sokkalingam Pillai, R.	1
271.	Vedantham Ayyangar, S.	1

Class II.

First Class Members. (Rs.10).

272.	Avadinayakam Pillai, K.	1
273.	Kondayya Sarma, A.	1
274.	Muthswami Ayyar, T. G.	1
275.	Onkaram, P. J.	1
276.	Ramaswamy Reddy, R.	1
277.	Rao Satyanarayana.	1
278.	Sankarayyar, S. A.	1

Ordinary Members. (Rs. 5)

279.	Abhishekanadham Pillai, P.	1
280.	Ananthan, M.	1
281.	Balaji Row, K.	1
282.	Chellam Ayyangar, D. P.	1
283.	Chinnaswami, M.	
284.	Fernando, S. P.	
285.	Gowrisankarayyar, M. P.	1
286.	Hanumantha Rao, P. V.	1
287.	Hanumanlu, S.	1
288.	Kannappa Pillai, P.	1
289.	Kesavanunni Nambiar, P.	1
290.	Krishna Rao Nayudu, M.	1
291.	Kuti Krishna Menon, M.	1
292.	Mangesha, B.	
293.	A. Maria Susai.	1
294.	Moses, A.	1
295.	Narayanayyar, L. K.	1
296.	Nellaikumara Pillai, P.	
297.	Ramachandrayyar, S.	1
298.	Ramana Rai, K. S.	1
299.	Ramaswamy Ayyar, S.	1
300.	Samuel Nallathambi.	
301.	Srinivasayyengar, S. R.	1
302.	Subbannachar, V.	1
303.	Sundaramayyar, C. V.	1
304.	Vaidhyanthayyar, M.	1
305.	Vasudeva Senoi, K.	
306.	Venkataharasimham.	1
307.	Venkataseshayyar, C. K.	

Class I.

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308.	Ayyaswami, U. S.	
309.	Balaji Rao, T. K.	
310.	Buchiraju.	
311.	Jagadeesan, R.	
312.	Kondala Rao, M. V.	
313.	Krishnaswami Ayyangar, M.	

314. Kuppuswamy Ayyar, Y.
315. Narayanamurti, N. S.
316. Prakasa Rao, M. V. S.
317. Ranga Reddi, C. M.
318. Sitharamaswami, V.
319. Viswanatham, V. S.
320. Vittal Punja, A.

Ordinary Members (Rs. 5).

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322. Gopala Chetti, M.
323. Hanumantha Rao, K.
324. Janakiraman, P.
325. Krishnaswamy Dikshithar.
326. Lakshmayya, J.
327. Lingappa.
328. Mahabala Rao, K.
329. Muthuswami Ayyar, S.
330. Namasiviam Pillai, C. S.
331. Raghavan, K. K.
332. Rajagopalachari, P. V.
333. Ramachandra Nayudu, M.
334. Ramaswami Raju, K. A.
335. Ranganayakulu, P.
336. Rangayya, G.
337. Sambasivan, M. A.
338. Satyanarayana, B.
339. Satyanarayana Gupta, K.
340. Satyanarayana, K.
341. Seshadri Ayya.
342. Sitharamayya, R.
343. Srinivasan, N.
344. Subbayyar, K. S.
345. Subramania Pillai, M.
346. Subramania Pillai, V. R.
347. Varadarajan, V. V. S.
348. Venkatarangam, A.
349. Vijayaraghavan, S.
350. Viswam, K. E.
351. Viswanatham, E. S.

THE JOURNAL

OF

The Madras Agricultural Students' Union.

CONFERENCE, 1916.

N. B:-Contributors are requested to send in their contributions written legibly in ink on one side of the paper only.—Editor.

Editorial.

College Day and Conference 1916.

Seven years have already rolled on since the Agricultural College was formally opened in July 1909, by H. E. Sir Arthur Lawley, then Governor of Madras, and in fitting Commemoration thereof, the Seventh College Day was duly celebrated on July 15, 1916. Providing, as it does, a welcome break to the rather monotonous and quiet tenor of life in the little colony, the event has begun to be increasingly looked forward to by the residents. The exciting sight of the numerous well-contested events of the Athletic Sports, the delightful entertainment provided by the students at theatricals, the pleasure afforded by the meeting of old friends, and the stimulus given to a mutual exchange of thoughts and experiences so essential to a

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practical science like Agriculture, the opportunities afforded for people mixing socially with one another at social entertainments, the very thrill and bustle of a busy and active time—all serve to make the event a conspicuous landmark in the rather even current of life at the Agricultural College.

A large corps of student-volunteers was organised under the able captainship of Mr. F. R. Parnell, the Government Economic Botanist, for attending to the various items of work in connection with the College Day and Conference. Mr. Parnell and the Sports Secretary, Mr. U. Vittal Rao assisted by students Ramana Rai, Onkaram and Samuel Nallathambi, are to be congratulated on the excellent decoration of the grounds and on the thoroughness and care with which the various events were arranged.

The special thanks of the Union are due to Mrs. Barber and Mrs. Harrison for their kindness in attending to the reception of the European guests, while Messrs. P. A. Raghunathasami Ayyangar, K. Sankaranarayana Ayyar and P. Ramasami Ayyar were responsible for the satisfactory housing of the Indian guests, and are to be thanked for the personal attention bestowed on the needs of everybody. The entertainment section owed its success to the able management of Mr. C. Narayana Ayyar assisted by student members, Kuppusami Ayyangar, Dharmalingam, Balaji Rao and Krishna Rao Naidu.

The earliest to arrive among the guests made their appearance on the evening of the 13th; the bulk of them

however reached the station on the 14th and 15th, though there were a few late arrivals on the 16th and even on the 17th.

The guests were received at the station by Messrs. K. Krishnamoorthy Rao and K. Raghavachari, and a party of Volunteers, and taken to the quarters arranged previously for them. Among the guests mention may be made of Mr. and Mrs. Gordon Fraser, The Hon. Mr. L. E. Buckley, H. H. The Rajah of Kollengode and his brother Mr. Madhava Rajah, The Hon. Mr. V. Ramabhadra Naidoo, Zemindar of Doddappanaickanoor, Messrs. G. A. D. Stuart, R. D. Anstead, Thomas and Hilson, Dr. Slater, Mr. Vengail Krishnan Nayanar, Rao Bahadurs I. Chinna-sami Pillai of Palghat and P. Subbaroya Aiyar of Madura, Messrs. Krishna Ayyangar of Mysore, Jogi Raju, Tirumalpad, Aswatha Aiyar, J. Chelvaranga Raju, K. Ramasastrulu Naidoo, D. Balakrishnamurthy, J. Narayan-murthy (Department of Industries) A. Krishnamachari (Inspector of Agricultural Offices), Sreekantiah of Pudukotah State, Javarayya, &c. &c. There were in addition a large number of officers from the District Staff. We beg in this connection to express our sincere thankfulness to the Director of Agriculture for the kindness in deputing quite a large number of the District and Farm officers to attend the Conference, and thereby contributing to make the gathering very lively.

On the morning of the 15th the ground presented quite a gay appearance, with its numerous flags, large and small.

There were all sorts of them from the large Union Jack floating majestically on the top of the College Tower, to the little ones representing all colours of the rainbow, along the tracks for the various events of the evening. Particularly conspicuous were festoons of numerous little flags marking the limits to the Race-course. Several shamianas and tents were erected to the south and the west of the Maidan to accomodate the European and Indian guests.

From about 1 P. M. in the afernoon, the spectators from the town and the villages began to gather. At about 3 P. M. there was quite a decent crowd around the arena. We take this opportunity to offer our thanks to the Police for help rendered in keeping the crowd in order. Quite a large number of gentlemen—both European and Indian—from Coimbatore kindly responded to our invitation and our sincere thanks are due to them.

The College Day having chanced to occur this year during one of the breaks in the monsoon, the weather was not all that was desirable, though the fore-noon was quite cool and pleasant. There was rather too much of the sun in the after-noon and the pleasant drizzly weather of some of the previous College Days was rather forcibly brought back to one's recollection. Though the day was hot, yet as there was no rain to mar the arrangements all the events were gone through successfully.

Messrs. Thomas, Fischer, Hamilton, and Sambamoporthy Ayyar acted as Judges. Messrs. Berry and

Matthews as Time-keepers, and Messrs. Taylor, Hart and Chelvarenga Raju as Starters. We are highly indebted to them for their kindness in doing their duties tiresome and arduous though they must have been in all truth.

Of the 22 items on the programme, the cross-country race of about 4 miles had been run on the 8th July, and the preliminary heats, and the races for coolies, on the 14th at 3 P. M.

Among the events, the most exciting was perhaps the Relay race, for which, the staff, class II and the old students competed and in which class II won beating last year's record of 7 minuts 10 seconds by about 14 seconds. The Tug-of-war was another exciting event which was watched with breathless interest. 5 teams came forward,

(1) The District Staff, (2) The Scientific Section in the College, (3) The Agricultural Section in the College, (4) Students of class II and (5) The Students of class I. Of these the District Staff and the Agricultural Section of the College came to the finals, and one of the most toughly contested fights was witnessed, victory seeming to be swaying from one side to the other until at last, the Agricultural Section headed by Messrs Wood and Carruth proved the winners.

While the events were progressing the guests of the evening were entertained at Tea by the Union. Mrs. Harrison assisted by Messrs. Wilson and Isaac kindly attended to the European guests, while the Indian guests were looked after by Messrs. Sankaranarayana Ayyar and Raghunathasami Ayyangar.

At the close of the evening, the crowd gathered round one of the large shamianas to witness the distribution of prizes. It was, however, disappointing to the spectators—and very much more so, to the prize-winners—to hear it announced that most of the prizes which had been ordered from Bangalore had been booked too late for the occasion. However the Medals and the Cups being ready, Mrs. Gordon Fraser very kindly presented them to the heroes of the evening. A consolation prize was awarded to Dharmalingam by Messrs. Pourval & Co., Bangalore. The Sports came to a fitting close by a hearty response being given to a call for cheers to Mrs. Gordon Fraser and the guests of the evening.

(Later on on August 1st Mrs. Barber kindly presented the prizes to the winners amidst a gathering of the Students and the Staff in the College Hall).

The next day at 8 A. M. the members of the Union met within the College Quardrangle for the Annual Group-photograph. The Photographer—we may here remark with excusable pride—has been finding it increasingly harder and harder year by year to arrange and compress all the members present into the biggest-sized plate he can get. The Union has indeed been continuing to expand year by year.

When the group-photo was over, the gathering moved upstairs into the big lecture-hall for the business of the Conference.

On the arrival at about 9 A. M. of the President elect the Hon. Mr. Gordon Fraser, the Conference was declared open. The President of the Union—Mr. Wood—in a

short speech reviewed the situation and welcomed the visitors. The General Secretary of the Union then read his Annual Report, after which the Chairman gave his Presidential Address, full account of which will be found elsewhere. The Munagala medal was presented to Mr. Jogi Raju and an annoucement was made of the award of the Sugarcane medal to Mr. Daniel of the Mysore Agricultural Department. This was followed by the excellent paper read by Mr. Thomas on "Some progress in the improvement of Tinnevelly Cotton." There was much discussion on some of the points touched upon by the reader. The paper itself is published elsewhere. Next, Mr. J. Narayanamoorthi of the Department of Industries spoke on the "Utilisation of subterranean water for irrigation," and explained his ideas with the help of diagrams. A very interesting discussion followed wherein Mr. Thomas gave his own experiences with the divining rod.

The Conference closed for the day at 11-30 A. M. The after-noon was devoted to an informal meeting of the ex-student members of the Union, to discuss freely and without reserve all the points to be brought up for discussion at the annual general-body meeting.

Mr. Jogi Raju was at home at 3 P. M. to all the members present at the meeting.

At 5 P. M. all went over to the well near field No. 50, to witness the demonstration by Mr. Ramachandra Aiyer of the working of his own water-lift. It was however regrettable that on account of the stays of the main-pully not having been fitted up well, the whole structure came

down and hurt one of the spectators. However, the necessary repairs were soon made and two days later, the inventor had the pleasure of demonstrating the working of the water-lift to the satisfaction of the spectators.

At 7 p. m. the guests were entertained with an exhibition of Athletic feats by a small troupe of North Indian acrobats, engaged specially for the evening by the Union. Although at the beginning some vexation was caused by the non-appearance in time of the mantle-lights and of the acrobats themselves, yet in the end all ended well. Some of the feats exhibited, such as the breaking of chains, hammering a block of stone to pieces on the body of a performing acrobat and stopping a Motor Car were certainly interesting and we hear it ended well also for the troupe, since they pocketed a silver collection of over Rs. 25.

The next day, the second session of the Conference met at 8 a. m. with the Hon. Mr. Buckley in the Chair, Mr. Gordon Fraser having left Coimbatore on urgent business. Mr. Chelvarenga Raju read his paper on "An Insight into the Indigo Trade of Madras" which was followed by a discussion.

Mr. Jogi Raju having kindly permitted his Munagala prize-essay to have been taken as read, the President called upon Dr. Gilbert Slater to speak of the Economic condition of India.

Mr. S. Subramania Aiyer next read his paper on the "Influence of the Palur Agricultural station on the Agriculture of South Arcot District."

He ended his paper with an invitation to the visitors to go round the College farm and inspect the crops, specimens of which—including samples of an excellent growth of Cholam, Dhaincha &c.—were exhibited along the back of the Presidential platform. Mr. Sreekantiah next read his paper on "Agriculture in the Puduccotah State".

The Conference closed with a vote of thanks to the Chairman and the visitors.

The General-body meeting came off at 2 p. m. The points discussed were (1) about giving a loan to one of the students (2) whether the Union Funds could be devoted to prizes in gardening and to night schools for the coolies and their children on the Agricultural Stations (3) several minor alterations in the rules (4) and the question of officer-members.

The Office-bearers^{gel} for the next year were then elected. A list as it stands at present is printed on the cover of July and subsequent issues of the Journal.

At 5 p. m. a Hockey match was played between the old students—aided by Messrs. Anstead and Hilson—and the present students—assisted by Messrs. Parnell and Wood. The old students stood beaten at the close of the game.

As usual the close of the Conference was marked by the lighting of the bonfire on the Maidan at 7. 30. p. m. In the bright light of the bonfire some of the boys started a merry-go-round and some *Tamasha* in the shape of a country dance was given by two of the students.

At 8 p. m. the resident Indian officers entertained all the Indian visitors at dinner in the Hostel in which distinction of caste and creed was temporarily submerged.

At 9 p. m. the students enacted portions of two dramas; the first being in Telugu and the other in Tamil. The Telugu piece was "Harischandra" and was well-enacted on the whole; of the actors Viswamitra, Harischandra and Virabahu, played exceedingly well and have been marked off by some of the generous spectators for the award of medals. The Tamil drama was "Pankajakshi" and was also very well done. The robber-sanyasi, was indeed beautifully represented. At the close of the entertainment, medals were presented to several of the last year's actors.

On the 18th July, the District Staff, Farm Managers and Assistant Farm Managers met in Conference and discussed points in connection with the management of the farms &c.

At 5-30 p. m. the visitors entertained the resident Indian officers at a Tea-party at the premises of the Officers' club.

The guests departed from Coimbatore one by one on the 18th and on the 19th leaving the residents to ruminate over the bustle of the previous three days and fall gradually into their usual groove.

***The Presidential Address.**

The invitation I have had the honour to receive asking me to preside at your Conference today was unexpected but I regard it as a recognition of the mutual dependence existing between Agriculture and Commerce in this Presidency and of the great part your College can play in helping to develop Commerce, as well as Agriculture, also as evidence of the desire on the part of your Director of Agriculture to bring Agriculture and Commerce into closer touch with one another. It was on these grounds that I accepted the invitation to be present today, as although I cannot address you on the Science of Agriculture, I may perhaps be able to give you a few hints as to the manner in which you, as Agriculturists, can study the commerce and trade of Southern India to your benefit.

Our Presidency, in fact all India, is pre-eminently an agricultural country and the commerce and trade of the country, both Imports and Exports, largely depend on the degree of success attained by the Farmers in raising their crops and livestock. Large crop of good quality mean increased prosperity, with more money available to spend on improvements and more capital to invest in and to initiate new industries.

In mentioning new industries I would direct your attention to such industries as deal directly with your agriculture. There are many in which the prospects of success are so bright, that your students with your special training, can well afford to confine your attention to them. By these I mean in the first place such industrial methods as will help to improve the outturn and quality of your crops. These you are now learning at your College and secondly such industrial work as deals with the preparation of your crops for the markets of the world.

In regard to the latter you may say, "Oh, but our work as farmers and cultivators stops when we have grown the crops."

* President—The Hon. Mr. Gordon Fraser.

This is true to a certain point, but if you want to reap the full benefit of your labours you must follow your crop right through to the consumers. What use is it to grow crops of good quality when they are adulterated by others before reaching the manufacturer or consumer. That this adulteration takes place is too true.

Also why deliver your raw material to foreign manufacturers until you have put it through as many processes of manufacture yourselves as you have facilities for. Work up your crops yourselves as much as possible and sell the excess to the foreign buyer. In Southern India agriculturists are in the fortunate position of growing crops which we may fairly class as world wide necessities and for which there is an ever growing demand from other countries.

Commercially, the demand for the crops you grow exceeds the supply, and there is a wide field for extension. It rarely happens that your produce is left lying on your hands at the end of a season, and when exceptions to this rule do occur I think I am fairly safe in stating that they are due either to the produce being held by speculators for a rise in the market, or to the fact that the particular lots unsold are so inferior in quality as not to attract buyers, and they are held over to mix with the next season's crop. I would like to refer briefly to a few of the crops of Southern India and their attendant industries.

We will take Paddy first and its rice-mill industry. The good effects of the work now being carried out by the agricultural department are shown in the more economical working brought about by the single seedling system. I am given to understand that if the whole paddy crop of the Presidency were grown under this system, it would result in a gain to the cultivators of the large sum, based on very conservative estimates, of over 100 lacs of Rupees.

Cotton comes next. With co-operation and systematic selection of seed the possibilities of improvement are almost unlimited. You must all bring your influence and energies to bear against any attempt on the part of short-sighted and unbusiness-like farmers to grow inferior cotton simply because they see the chance of a little extra immediate profit. You have all no doubt read the remark recently made by the Hon'ble Mr. Buckley at Tiruppur on the attempts made by misguided ryots to introduce inferior cotton in the Tinnevely District. I commend Mr. Buckley's remarks to your attention.

As for the commercial side of cotton growing, I can assure you that the demand exists for all the cotton of good quality that you can produce, and the premium in price that growers can command for cotton of superior quality will amply repay them for any extra trouble and expense they may incur.

The groundnut crop is now a very profitable one in the Presidency, but in the past it has gone through precarious times due to ignorance and thoughtlessness on the part of the cultivators. Inferior seed was used, crop after crop was taken off the same land until the land was exhausted, deleterious methods of preparing the kernels for the market were and unfortunately are still, in force, and adulteration by the middlemen was freely indulged in and is still a common complaint, but the use of machines for decorticating has improved matters in this respect. I cannot advise you as to the agricultural methods to adopt to improve the quality and outturn of your groundnut crop. This you will learn in your College, but I do advise you in your own interests to give more attention to the matter commercially and to insist on the crops you grow being marketed in the most efficient and profitable manner possible.

Commercially, I think the groundnut crop has suffered more than any other, through adulteration and injurious methods of

marketing. I do not say it is the fault of the farmers. I don't think it is, but the fact remains it reacts on them and they are the losers; so it is up to them to see that matters are improved. I will again refer to adulteration later on, but will point out now the loss resulting from the inferior methods adopted in preparing the kernels for the market. You all now know how the shells are wetted and then beaten with sticks by coolies. The result is the kernels get damp and long before they reach the crushing mills they are discolored and the oil in them is rancid. Probably about 75% of the crop is still treated in this manner. The remaining 25% is decorticated in the dry state by machinery and the kernels resulting are clean, wholesome, and sweet. Now I will show you where the commercial results affect the growers. Last week my firm paid Rs. 37 per candy of 529 lbs. for the clean, sweet, wholesome kernels decorticated by machinery, but only Rs. 31 for kernels decorticated by the wet process by hand labour. Also before being paid for, the kernels decorticated by the wet process are spread out and cleaned by our own staff and dried in the sun to our satisfaction. All this trouble and expense is not necessary if the kernels are decorticated in the dry state by machinery. At the prices I have mentioned, you will see that the superior quality commands a premium of nearly 20%. The average annual value of the exports over the four years ending 1916 was nearly 400 lacs of rupees. Probably kernels representing about three-quarters of this amount were decorticated by the wet process, say 300 lacs worth, and had these been decorticated by machinery the extra return to the ryots would have been 60 lacs, or 240 lacs of rupees for the 4 years. The wide field of enterprise before you is shown by the fact that two improvements, the single seedling system for paddy and machine decortication for kernels result in the gain of 100 lacs and 60 lacs of rupees and these gains should go into the pockets of the cultivator.

Industrially the Groundnut crop provides opportunities for starting decortication factories, and oil crushing mills.

A most successful and profitable crop since the war started has been Indigo, but it remains to be seen whether the revival will be permanent or not. If it proves permanent then I would recommend to growers the desirability of taking more interest in the manner in which their Indigo is prepared for the market. I am not an Indigo expert, but I cannot believe that there is good reason for the wide variation in the quality of the stuff offered for sale. The greatest praise is due to Mr. Chadwick and the Agricultural Department for the prompt measures they took to place ryots in a position to grow Indigo to meet the demand which they foresaw was likely to arise during the war. It has proved a most profitable crop to all concerned.

Individual ryots cannot, of course, be expected to build ginning, decortication, or Indigo factories, but something might be done by the co-operation of ryots in a district. They could thus treat their crops with mutual benefit to themselves, but no doubt this point will be considered by the enterprising department under which you are working. In marketing your crops set your face firmly against adulteration of any kind. In the first place it is cheating, and secondly unbusiness like and unprofitable.

The first objection requires no explanation but the second does. The seller who adulterates his goods can only do so on the supposition that he can fool his buyer. I can, however, assure you that the ultimate buyers, especially the manufacturers, are far from being fools. If I buy produce and find it heavily adulterated I either leave that particular seller severely alone in future, or deduct an ample allowance from my price next time not only to cover the risk of adulteration but also to cover the cost of cleaning the produce and removing the foreign matter. Whichever way you look at it the adulteration of crops results in

a definite loss to the ryots. It is the same with Cotton. Cotton badly ginned or adulterated means extra work thrown on the machinery of the Spinning Mill to clean out the rubbish. This results in a reduced output, and consequent higher working costs, and also extra wear and tear to the machinery. When next buying that particular class of Cotton this Spinner makes ample allowance not only for the probable adulteration, but also for the extra expenses incurred in cleaning the cotton. The adulterator goes to some expense and trouble in mixing foreign matter with the cotton, and the manufacturer has the expense of taking it out again, but unfortunately the expense in both cases comes out of the ryot's pocket. A manufacturer or consumer very soon sees how the land lies and by adulterating produce, two or three unscrupulous middlemen can quickly give a district a bad reputation, and for the sake of a few rupees extra immediate profit they reduce the value of the whole crop.

You can't hide adulteration, it must come to light during the process of manufacture. The oil crusher keeps a record of the out-turn of oil from the seed he uses, and the spinner knows exactly the wastage of each class of cotton he puts through his machinery. It is the same in all well run factories, and the manufacturer bases his purchase prices on his actual results. The unscrupulous seller not only damns the produce in the eyes of the manufacturer, but he also robs the Farmer of benefits he is rightly entitled to.

I therefore impress upon you not only to pay particular attention to quality in growing your crops but to see that your produce is marketed in such a manner as to do you credit and give you a good name in the various markets in the world. In times of bad trade it is the inferior goods which suffer first, it is the produce with a good reputation that the buyer takes leaving the inferior stuff alone.

You, gentlemen, have a great responsibility on your shoulders, as with the advantages of your College training you go out into the world well equipped with knowledge, and it rests with you to set an

example and help your neighbours who are not as well qualified as yourselves. If you find that your knowledge and training help you to cultivate crops superior in outturn and quality to those of your neighbours, do not hesitate to give them the benefit of your experience. This you should do on unselfish grounds, but there is also a selfish reason and that is that the larger and better the crop the stronger the demand likely to arise and better prices will be paid you for it. A large steady supply of raw material of good quality is always an inducement to manufacturers to take an interest in that particular crop, and it generally means a stronger demand with higher prices.

In conclusion, my advice is, go in for good quality, grow the very best your land, your seed and your knowledge and experience will give you, avoid adulteration, and by co-operation see that what you do grow is prepared for sale in the most efficient manner possible as by this reason you ensure the most profitable return for your labour.

We all look for great results in commerce and agriculture from the efforts of the students, past and present, of this College, and I am sure they will not disappoint us. It has been a great pleasure to me to be present and preside at your conference to-day.

***Some Progress in the Improvement of Tinnevely cotton.**

In accepting the invitation of the committee of the Agricultural Students' Union to address this assembly, I would like to state that I have been somewhat perplexed in my attempts to discover a topic which I thought would be of equal interest to both the expert and would-be expert agriculturists whom I have the privilege of addressing. Having decided to make "Cotton" the basis of my address, I would, at the outset, tender to you my apologies for imposing upon you a subject which has but recently been handled within these walls by a master Economist. I refer to the interesting and valuable lectures

*The lecturer exhibited specimens of the cottons referred to in the lecture and the cotton tract was shown by a specially prepared map.

Paper by Mr. R. Thomas, B. Sc., Dy Director of Agriculture, Trichinopoly.

delivered by Professor Todd which have, at least in part, been wisely reproduced in your Journal. He broached the subject of Indian cottons in general, on the economic side. He conveyed to you an idea of the necessity, the urgency and the room for improvement of Indian cottons. It was with good reason perhaps that he dwelt but casually on the progress that had already been made, or on the means already being adopted to effect a radical improvement. This paper concerns itself with the attempt that has been made to attain this end in the case of Tinnevelly cottons and it may be of additional interest now that our President has also addressed us on the marketing of cotton.

The cotton season which is about to come to a close has been a very critical one in the history of the improvement of Tinnevelly cottons. But before proceeding to recount the more recent developments, I will endeavour to convey to you some idea of the work which led up to the situation with which we were confronted at the commencement of the current season.

I will take you back to the year 1908 when Mr. Sampson, who is now enjoying what I assure you is a well-earned rest, first started selecting superior types of Tinnevelly cottons. His work was confined to the Koilpatti Farm. You will see from this sketch that the farm is situated roughly in the centre of the black cotton soil tract of Tinnevelly and Ramnad. It is probably known to most of you that there are in this tract two distinct varieties of cotton—*Uppam*, in the north and as far down as Satur, and *Karunganni*, further south as far as Tuticorin. You get a transition area where the cottons are grown in roughly equal proportions. But you find stray plants of both varieties scattered all over the tract. This distribution is a natural one. The southern tract is affected by the Uppam or sea breeze in which habitat Karunganni cotton alone thrives well.

Koilpatti, then, you will notice, is on the borders of the Karunganni tract. When selection work was first started at the farm, both of these varieties were experimented with. Under the

conditions obtaining here, it was discovered that what is known as Karunganni cotton not only gave an average higher yield, but possessed considerably more variability than Uppam. So that in the course of time the latter was completely discarded; and at present, selection work on the black soil at Koilpatti is entirely confined to Karunganni cotton.

Selection work with cotton probably conveys a vague meaning to many of you especially when it is considered that such crops as sugarcane and paddy demand the attention of whole time officers. To those of you who are only acquainted with selection work in the form that it is being conducted by the Sugarcane-Expert and the Government Economic Botanist, the system adopted at Koilpatti may be of interest. And though this system has no pretence of being highly scientific, yet for our immediate needs it serves a useful purpose.

In 1908 Mr. Sampson after examining a large number of plants decided to confine his selection work to two main types of plants one being small, bushy, early-flowering and possessing a large number of vegetative branches. The other being tall, late-maturing and bearing mostly fruiting branches. Since then, and up to the beginning of the present season a large number of plants from these two types bearing superior characters have each year been bagged in the field. The season cotton as distinguished from the summer picking is thereby collected and examined. The examination of kappas from these single plant selections involves the scrutiny of a number of characters amongst which are included—length of staple;

whiteness;

fineness;

silkeness;

lint outturn; and

uniformity of staple.

More recently the yield of kappas per plant has been given greater consideration than formerly. For each of these characters the produce of each plant is allotted a definite number of marks. Only those plants are retained and propagated which show all round excellence.

In the course of these investigations, plants have been discovered with a lint outturn as high as 36% against 25% for ordinary Tinnevellics, and others having a length well over one inch as compared with the average of $\frac{1}{2}$ inch for Tinnevellics. Very few plants have been discovered which show all round excellence. This naturally means that an exceedingly large number has to be discarded—having failed to survive the severe test to which they are subjected.

Having survived this preliminary test, the question of propagation arises. The single plant selections which do survive are grown on 5 small comparative plots each bearing 75 plants. Those which are not true to type are at this stage discarded.

In the third year the best of the 2nd year strains are sown on the field plot scale of 5 cents and on to the field crop scale of 1 acre in the 4th year. If they continue giving satisfaction they are grown on contract by ryots under seed farm conditions. It is only at this stage i. e. 5 years after the original selection was made that the strain can be grown in ample quantity to be submitted to spinners for testing. If these final tests are satisfactory, the strain is grown on as large a scale as possible, i. e. about 400 acres, under seed farm conditions in the 6th year. The kappas from these seed farms is bought and ginned by the Department and the seed distributed in the 7th year through depot agents to the ryots. Even then it is not being grown on a sufficiently large scale to attract the attention of exporters who only care to handle cotton in bulk. In the 8th year the situation is changed, for the seed of these superior strains has then been distributed on such a scale to ryots that cotton derived therefrom becomes a marketable commercial commodity.

This then is the brief history of what are now being marketed on a commercial scale as Company No. 2 and Company No. 3 samples of which are available. This stage had for the first time been reached at the commencement of the current season and it explains an earlier remark made in this paper that this year has been a very critical one in the history of the improvement of Tinnevelly cotton.

In past years all the cotton grown by the Department on the Koilpatti Farm as well as that grown on contract under seed farm conditions was sold to local spinning mills at a nominal premium. The premium paid per candy of 500 lbs. of lint in excess of the ruling market rate rose steadily from Rs. 3 in 1913 to Rs. 7 in 1915. For this encouragement the local spinning mills deserve our thanks. This cotton had not been offered to exporting firms previous to this year. At the commencement of the present season, a circular was sent to all firms in Tuticorin who dealt in cotton intimating them that there would be on the market this year some 1,600 candies of Company No. 2 and 400 candies of Company No. 3 small samples of these cottons were sent to each firm. They were further informed that the Department might be able to arrange the delivery of the major portion of these cottons true to the quality and the class of the sample submitted. On the strength of this guarantee practically all the firms offered premia. These varied from Rs. 4 to Rs. 10 per candy of lint in excess of the ruling market rate.

Now of the 2000 candies of lint of what have been designated "Company" cottons reported to the various firms to be available this season only some 120 candies were grown by the department. But registers have been maintained noting the names of those ryots to whom seed had been distributed at the beginning of the season. It was incumbent upon the department, therefore, to devise some means of ensuring the delivery direct to the firms of Company cotton grown by ryots. A system of certificates was instituted whereby the purity of the kappas delivered was guaranteed. Here is a sample certificate—a mere scrap of paper, perhaps—but it serves many a useful purpose. These certificates guarantee the purity of the kappas delivered. They ensure that the ryot will receive the maximum premium for his kappas. They further ensure that the cotton will be brought to the notice of foreign markets in its pure state at least by those firms who do not utilise it for grading up inferior strains. Other useful purposes which they incidentally serve will be alluded to later.

At present cotton improvement work in Tinnevely has Koilpatti as its focus. The Farm manager, in addition to being in charge of the local circle with Koilpatti as its head quarters is responsible for the general conduct of work throughout the tract. There are four other circles with head quarters at Puthiamputhur, Kadambur, Satur and Viruduppatti respectively—the latter two being comparatively new. Each of these is in charge of an Agricultural Demonstrator who is directly responsible for cotton improvement work within his circle. When offers of premia for Company cotton were received from the respective firms some 3 months ago, these were immediately communicated to the circle Demonstrators. These, in their turn, conveyed the happy news to those ryots who held stock of Company cotton. The ryot decides for himself to whom he takes his cotton, but he is no such fool as not to take it to the firm which makes him the highest offer. This led to an interesting development. Many of the firms were anxious to procure these cottons. The competition led to over-bidding, and the season is about to come to a close with a premium as high as Rs. 16 per candy being paid for Company cottons. In one isolated case I have received a premium of Rs. 17 for farm cotton. The competition had been so keen that I had open offers from more than one firm of a premium of one Rupee in excess of what any other firm was prepared to give. Such offers, of course, were discountenanced; and only offers of specific premia expressed in rupees were communicated to the Demonstrators. I here desire to emphasise the fact, and to make it absolutely clear, that there has been no hankering whatsoever for enhanced premia. Subsequent to the issue of the original circular, already referred to, no firm has been asked to raise its premium or has been informed what premia were offered by any of the other firms. All offers of premia have been spontaneous on the part of the firms.

The greater portion of this company cotton has naturally been delivered to those firms which were most anxious to procure it, that is, the firms which paid the highest premium.

Agents of other firms tell me that a premium of Rs. 16 is inflated and does not truly represent the intrinsic value of our Company

cottons. For, at present rates, this premium involves an aggregate cost exceeding that paid for Middling Americans, which are now valued at about $\frac{1}{2}$ penny a lb. above F. G. F. Tinnevellies. This premium of Rs. 16 may or may not be inflated. It concerns the purchaser more than the seller. It is probable that such a high premium will not be paid in future years. That remains to be seen. If any firm cares to offer to the ryot through the department a premium of Rs. 16 for his kappas, it is the duty of the department to tell him so. As a matter of fact, I have a shrewd idea that Company cottons will soon be grown on such a scale that they can be purchased practically pure at just a nominal premium. There have been many cases in the present season even where Company cottons unaccompanied by certificates have been delivered to the firms and little, if any, premium paid for the lint. Dealers or Middlemen have been paying as much as Rs. 3 per pothi for this kappas over the ruling market rate. I have in mind one outstanding case where an exporting firm submitting to arbitrators on the Liverpool Cotton Exchange a sample of ordinary Tinnevellies, a sample of good average Tinnevellies and samples of Company No. 2 and Company No. 3. Company No. 2 was valued at Rs. 127 $\frac{1}{2}$ per candy of lint and Company No. 3 at Rs. 199, ordinary Tinnevellies being Rs. 189. But the astonishing part of these valuations was that good average Tinnevellies were valued at the same price as Company No. 2 i.e., 197 $\frac{1}{2}$ Rs. This was of special interest and certainly called for investigation. The origin of this good average Tinnevely was enquired into and it was discovered that it was nothing else than Company No. 2 delivered to the firm as a good sample of ordinary Tinnevellies at a nominal premium.

If then, after a few more years work these Company cottons can be procured in the open market at but a nominal premium, if any, you might reasonably ask, what is the use of the department wasting its energy and public money on cotton improvement? In reply, I would repeat and endorse a remark recently made to me by Mr. Chadwick that it will be a happy day for the department when the standard of F. G. F. Tinnevellies on the Liverpool market has been

raised as a result of the efforts of the Agricultural Department. Should that ever happen, there will be no necessity for payment of premia except for strains of cotton which may be superior to any that have hitherto been marketed. You might still wonder where and how does the Indian cultivator profit. I may tell you that at present prices, he soon becomes a wealthy man who grows Company cottons on a large scale. I am not far off the truth when I tell you that in addition to the profits he would make by growing ordinary local cotton, the Tinnevely ryot has now the means whereby he may pocket an extra 10 to 12 Rupees an acre on black cotton soil whose rental even is seldom more than $1\frac{1}{2}$ Rupees.

The ryot does not as a general rule profit considerably from the high yields of Company cottons, for, on an average, they give only a slightly higher yield of kappas than ordinary country cotton. For his profits he relies on the superior quality of the lint, on the high lint outturn of the kappas, and on the demand for his seed at a premium.

Firstly—a premium of Rs. 16 per candy of lint, means to the ryot an additional profit of Rs. 3—10—0 per acre.

Secondly—cotton giving an average lint outturn of 30% as compared with 25% for ordinary country cotton means to him an additional profit of Rs. 6 per acre. It is this factor that will make it profitable to the ryot to grow Company cottons in the absence of any premium, and it further explains why middlemen find it profitable to pay a premium of Rs. 3 per pothi for the kappas and yet not get any premium for the lint obtained therefrom in the absence of a certificate. For certificates are issued to actual growers of Company cotton and never to middlemen.

Thirdly—there is demand for pure Company seed at a premium and this means to the ryot an average additional profit of Rs. 2—8—0 per acre. This makes an aggregate net profit of Rs. 12—4—0 in excess, I would again point out, of the profits normally made by growing ordinary country cotton. These high profits have this year served as an excellent advertise-

ment for our cottons and there is already an unprecedented demand for Company seed from all quarters—a demand which the Department cannot hope to supply. Even tracts as distant as Coimbatore and Hyderabad are getting interested in these cottons.

I think that I have now made it sufficiently clear that Mr. Sampson has succeeded in turning out high grade varieties of cottons which can be profitably grown on the local black soils, and which are superior to anything the ryot had hitherto at his command. It still rests with the Department to organise a system by which these cottons may be delivered unadulterated to the firms on a wholesale scale. Adulteration,—that cankerous disease towards which so many branches of Indian trade evince a predisposition—, is likely to be the greatest obstacle against the continued success of improvement work with Tinnevely cottons. It appears to me that the best guarantee against adulteration is to remove the adulterant from within easy reach of the grower and to dispense with the services of the middleman. This end can only be accomplished by organising amongst the ryots who supply the market with this cotton a complete system of co-operative societies dealing in the purchase and sale of kappas and of cotton seed. It is a big undertaking, but even if it should be only partially successful, the Department will have succeeded in saving what is commercially known as Tinnevely cotton from falling from the high position it now holds among indigenous Indian cottons, a position which, owing to the recent incursion of Pulichai—a new inferior class of cotton—it would soon be in danger of losing.

I have previously referred to the use that is being made of these certificates. I will endeavour further to explain some of the useful purposes which they have been found to serve. There are two certificates "B" and "C." Certificate "B" bears the name of the ryot who has been supplied with Company seed;

his father's name; the area he grew under cotton; the area under Company cotton; the quantity previously ginned and the quantity he now proposes ginning. This is issued to the ryot by the Circle Demonstrator who signs and dates it. As many ryots as possible in each village are induced to gin their kappas co-operatively and certificate "C" is then issued. This bears the current market rate, the premium paid, and the name of the spokesman who attends to the sale of the whole consignment. These certificates are then taken over and signed by the firm's representative who forwards them to the Deputy Director of Agriculture for registration and check purposes. Ryots now realise that these chits are often worth considerably more than their weight in gold, and some system of check on their issue is found necessary. When a ryot attempts to deliver adulterated kappas under a certificate, that certificate is forthwith cancelled; no premium is paid for his cotton, and his name is black-balled for the ensuing season. These penalties act as a deterrent against adulteration. This system of certificates was originally introduced with the primary idea of meeting and checking attempts at adulteration, for reports from other provinces indicated that wilful adulteration had proved to be a formidable bar to continued progress. It is to the guarantee that the Department could give this year regarding the purity of ryots' kappas that the high premium obtained is largely to be attributed. This novel system, I may say, is still in the making. It has proved a decided success this year, but the scale on which it will be possible to distribute these certificates will have to be strictly limited if we continue issuing them to individual ryots. The staff at the disposal of the Department could never cope with the work involved by such a wholesale distribution of certificates. For each circle Demonstrator has always to satisfy himself that certificated kappas is unadulterated and before this can be done he has to inspect it personally.

This brings us to the question of Agricultural Co-operative Societies. These are being organised for the purchase of Company kappas belonging to members of the Society and for the sale of the lint derived therefrom. At the same time they act as Central Seed Unions for the surrounding villages. By limiting the issue of certificates to Agricultural Societies only, much work will be taken off the hands of the Agricultural Demonstrator and the Society can be relied upon to satisfy itself that more of its members reap illicit profits through willful adulteration at the risk of the loss of the Society certificate and its attendant privileges. It was hoped this year to set on a co-operative basis some fifteen such Seed Unions which might at a later stage be registered as Agricultural Co-operative Societies. On facing the problem, however, numerous difficulties arose, some of which appeared to be unsurmountable. With the assistance of an Inspector of Co-operative Societies a satisfactory solution to many of these difficulties was forthcoming. We succeeded in getting the ryots to co-operate in four different villages in two of which there already existed unregistered Agricultural Societies. The remaining "embryo" seed unions, where pure seed is stocked but is not sold co-operatively will have to wait until the Department has gained experience with seed unions just formed. These unions deal only in cotton and in cotton seed, and as they are at present in a purely experimental stage, I shall not dwell further on details regarding their organisation, but the formation of some such unions on a large scale throughout the tract appears to me to be the only satisfactory solution to the question of adulteration of our improved type cottons. They have proved successful in the Central Provinces and there appear to be no valid reasons why they should not succeed in Tinnevely. Their success, I am convinced, is the key-note to the successful continuance of improvement work with Tinnevely cottons.

Gentlemen, I am afraid that I have already detained you beyond the time limit allowed me, and I must thank you for the very patient hearing you have given me. If, however, I have succeeded in conveying to any of you a clearer idea of the work that has been, and is being, done to improve Tinnevely cottons, then I shall feel satisfied that neither my efforts nor your patience have been taxed in vain.

Yet I cannot conclude this paper without alluding to the sterling work that has been done by the Farm Manager, Koilpatti, and the staff under his charge on whom have devolved the supervision of and responsibility for the field work and district work which are so essential to the success of any form of agricultural improvement conducted on a large scale.

*** An insight into the Indigo trade of Madras.**

When the General Secretary of the Agricultural Students' Union (Mr. K. Krishnamoorthy Rao) requested me to contribute a paper to this year's conference, I had my misgivings regarding the choice of an appropriate subject. After some consideration I chose the subject of 'An insight into the Indigo trade of Madras.' Not because I thought I could do justice to the subject, but because I felt I was asked to perform a duty which as an old boy of this Institution I was bound to do. In doing it I thought the subject would give rise to enough discussion and remarks which might perhaps throw more light into the subject and give us an opportunity to concert measures to remedy the defects and evils if any in the present manner of carrying out this trade and industry. If in the discharge of this duty I err as I am apt to do on account of my inability to fulfill your expectations of me, I feel sure you will forgive me.

Historic condition of trade.

Indigo is popularly known as king of dyes and from time immemorial the use of this dye is known to Indians. The Sanskrit word 'Nila' shows that this dye is more intimately associated with

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Indians than any other dye from the earliest ages. Although a far large number of plants were resorted to in earlier days in the manufacture of this dye in India yet, there are proofs to show that from the year 1298 (Marco Polo gives an account of the Indigo Industry) that the plants used in the manufacture of this dye are from Indigo species. There are also evidences to show that the Industry was carried on in Quilon in this Presidency as well as in Western India and that the dye was purchased and exported from India to England by Europeans. The Portuguese are said to have carried these to Lisbon and sold them to dyers of Holland. The formation of the Dutch East India Company in the year 1631 is attributed chiefly to the desire to secure a more certain supply of the dye stuff from India.

The rise or fall in price of this dye has been regulated from time immemorial by the seasons, acreage under the crop, the amount of dye obtainable from an acre of plant and upon the competitions of other countries, so much so that a fall in the total quantity of dye produced necessarily brought in better value, but with the introduction of synthetic dye a short yield no longer meant an increased price and this is exemplified amply by a perusal of the statistics relating to the dye produced and value realised in different periods.

How history repeats itself in the rise and fall of prices and reasons for such fluctuations.

The truth of the well known adage that 'History often repeats itself' will be found to be more applicable to Indigo than any other Indian agricultural or industrial product. A perusal of the early history shows that shortly after the overthrow of the Portuguese supremacy in the East, the success of the Dutch merchants in the Indigo industry aroused the jealousy of Europe, so much so that the merchants of Germany, France and England were threatened with ruin and to protect their interests, every country passed edicts rendering the importation or use of Indigo a criminal offence, punishable by death. The opposition to Indigo was so strong that it was at some time prohibited as being a poisonous substance to those who used it. But the export from India was persistent and this stimulated the farmers

of other countries outside India (Spanish, Portuguese, French, and English) to grow this crop and manufacture the dye. The results obtained by the foreign countries in the successful cultivation of the Indigo crop revived the ancient Indian trade. But about the year 1747 the better profits realised from sugar and coffee by West Indian cultivators coupled with the high duties one had to pay on Indigo minimised the foreign competition and the Indian trade was again re-established not in Western India but in Bengal. But within a short time a set back was given to the trade owing to some misunderstanding between the planters, the cultivators, and the Government of Bengal and between 1776 and 1800 the Industry was shifted from Bengal to Tirhoot and the United Provinces. From the year 1780 to 1802 India was once more in the foremost ranks among the Indigo producing countries of the world and this state of affairs continued till 1895-1896 which may be practically stated to be a record year when Madras exported 62,425 cwts of dye. In spite of the numerous local upheavals the prosperity of the Indigo Industry may be said to have been almost phenomenal for nearly a century. But a crash came in after this year owing to the first commercial production of synthetic Indigo in 1896 and a perusal of the statistics from 1896 to 1914-15 will reveal that the record is a melancholy one, showing that there has been a continuous decline until 1914. The year 1914 shows a slight increase over that of the previous year. In the next year i.e. 1915 the produce increased from 3,334 to 16,790 cwts or in other words nearly 5 times. The quantity exported during the four months ending with April 1916 is 15,375 cwts or nearly equal to that exported in the whole of last year. It is clear thus that the trade is increasing by leaps and bounds since 1915 and that this is chiefly due to the absence of synthetic dye in the market.

The exports of 1885-6 were	45,828 cwts.	
Ten years after 1895-96 they were	62,425 cwts.	
Seven years after in 1903-04	24,414 "	
in 1904-05	16,700 "	
1905-06	7,755 "	
1906-07	11,159 "	
1910	2,847 "	
1911	2,547 "	
1912	2,384 "	
1913	1,372 "	
1914	3,335 "	

Present state of Indigo trade and prices.

In the year 1915, 16,790 cwts. or in other words the same quantity as was exported in 1914-15 was available. For the four months ending with April 1915, 15,375 cwts. were exported while only 3,281 cwts were exported for the same four months during 1915.

If the prices of the various periods are taken into consideration, it will be clear that the average price per maund of 25 lbs. was

in 1894-95	...	...	...	Rs. 63-0-0
1895-1896	...	...	...	" 63-0-0
and in 1906-07 it fell down to	...	...	...	" 44-0-0

The unremunerative levels to which prices have been forced down by competition of Synthetic Indigo after this year (1906-07) was the chief cause for the reduction in the area and quantity exported. The prices paid during the years 1915 and 1916 have never been heard of in the annals of Indigo trade. The estimated value of 1,190 cwts of Indigo shipped during April 1916 amounts to Rs. 6,29,411 or in other words at nearly Rs. 123 per maund. This is equal to nearly three times the value realised in 1906-07 when manufacture of Indigo was given up as unremunerative and about double the price realised in 1895-96 when India was held once more in the foremost ranks amongst the Indigo producing countries of the world.

The startling prices now ruling in the market are bound to continue until the close of the war and reappearance of synthetic dye in the market. In the event of the war continuing (which none of us wish) the same prices will continue until Madras is capable of exporting up to 62,000 cwts. and until other countries compete again with India and flood the market with their Indigo.

Ryots not profited by these fluctuations.

There has been some apprehension in some quarters that the ryots have been benefited a good deal by the unheard of prices at which Indigo dye is at present sold. A critical study of the conditions of Indigo growing ryots reveals it otherwise. The grower of Indigo is not the person who is benefited. He no doubt slightly gets better prices

than what he used to get for the leaf in previous years. But this increase is incommensurate with the increased prices obtained for the dye. Although the ryot who cultivates this crop knows that better profits are realised for the dye now-a-days, he is quietly satisfied with the growing of the crop and is completely indifferent and apathetic to the idea of manufacturing the dye himself even if such a thing were to be suggested to him by any one. When questioned as to why he does not care to manufacture himself, he simply quotes the proverb that, that manufacture of Indigo and alchemy are so very uncertain things and that he completely believes in the Tamil saying (தெய்வம் சான்ற) and further states that at the time of steeping of the Indigo plants in the vat a number of small insects and living organisms found in the plants are suffocated and subjected to death and as such he commits sin and that he has been ordained not to commit such. This religious sentiment coupled with the old adage that Indigo manufacture is akin to Alchemy prevents him from engaging his attention towards the manufacturing aspect of Indigo. The Indigo growing ryot in my opinion should not be considered as a conservative man as he has taken kindly to the manufacturing side of the crops like Turmeric, Sugarcane, Tobacco and the like. I think the earlier cultivators should have realised from their experience the difficulties in the sale of this stuff together with the constant fluctuations of the market and should have therefore thought out that anything touching upon religious sentiment only will prevent ryots from risking the very little money they possess by speculating in the manufacture.

Manufacturer not benefited.

A close touch with the several Indigo manufacturers particularly in the Central Division reveals, that even the manufacturers of Indigo have not been benefited by the current prices. They have never realised for average samples more than Rs. 50 per Madras maund. Several manufacturers have been and are still complaining that they do not obtain fair treatment in the hands of the merchants who export this to Europe and other countries. The wholesale merchants who are exporters complain that the articles supplied by the manufacturers are not good and on that account the manufacturers do not obtain what

they ought to get. Thus one blames the other in his turn. As one who has studied and come in contact with both the parties, I am rather inclined to blame the wholesale exporter than the manufacturer as there is no fixed standard by which the exporter fixes his value on the article offered for sale by the manufacturer.

Reasons for same and necessity for adulteration by the Manufacturer.

Every one of the exporters has a dubash or middleman who fixes the prices and settles the bargain for both. The hardships and difficulties which the manufacturer undergoes before he sells his produce coupled with the complete ignorance (pardon me gentlemen for the use of this word) of the export merchant and his dubash of the ways by which a sample could be judged properly and the consequent unsatisfactory valuation fixed on a sample leads the manufacturer to adulterate the stuff to his best advantage.

History shows that during the earlier ages different plants and species of Indigo were mixed and the dye was extracted. Although several improvements in the manufacture of the dye have been introduced by European planters in Bengal the local manufacturers are quietly continuing their own methods simply because enough advancement has not been made by anyone to detect to what percentage adulteration has been practised by the manufacturers. This position has been very well understood by the manufacturers who adulterate; and the dubash who settles the bargain for the wholesale exporter taking this factor to his advantage fixes his own rates according to his will and pleasure. Gentlemen, I should not be understood as one exaggerating facts. It is from my personal experience and observation I talk this. A good sample of Indigo was sent by me to one of the exporters in Madras and they valued it at Rs. 70 per maund. The same sample when sent to another exporter the same day was valued at Rs. 50 per maund. Again a sample which was adulterated with cent per cent silt was valued at higher rates than a sample of pure and unadulterated Indigo.

How Indigo is Classified in the Market.

The Indigo sold in the Madras market is broadly classified into the following sorts.

1. Deccan. Those manufactured in Nandyal, Cuddapah and exported to Europe. Light in weight and violet in colour.
2. Locals. Puttanam, Puthupalayam, slightly heavier than Deccan but violet.
3. Nellore. Grown in Nellore. Used for local dyeing. Exported to England. Heavier than No. 2.
4. (a) Ahtur Perambalur. Same as Deltas exported.
(b) Delta. Those manufactured in Guntur, Godavari, Krishna. Slightly darker in colour. Ranks with Ahtur Perambalur.
5. Southern. South Arcot. Of different colour and as heavy as Delta.

Methods adopted at present in judging the quality under each class.

The methods on which the price is fixed on each class of Indigo above noted by the Dubash of the exporter have been from time immemorial the same and they are:—

1. The sample when broken should be of pure grain and violet colour and when exposed to sun, a shining colour should be visible.
2. Sample should be light and dry.
3. A sample piece thrown in water should float in water.
4. If a sample is thrown in fire it should emit a light vapour and should leave very little ash.

The various classes into which Madras Indigo has been assorted and the characteristic tests by which value for each

class is fixed, therefore give the manufacturer an opportunity to mix the qualities in different degrees and proportions and enable him to get good prices even when adulterated.

How adulteration is effected.

The accumulated experience of ages has taught the manufacturers how best these tests could be satisfied even when the adulteration has been done. For imparting the violet colour, vats have been constructed in some centres where the water used in steeping and boiling has some brownish colour and some traces of copper. In places where such facilities do not exist the juice obtained from prickly pear fruits is added to the stuff at the time of boiling. This juice easily mixes with the vegetable colouring matter and gives the necessary violet colour to the dye.

To satisfy the swimming property some oil is poured in at the time of beating in the vats and at the time of boiling. The oil gets mixed with the colouring matter and when it is thrown in water the piece swims in water and does not easily sink even though a certain amount of fine silt has been mixed with the dye at the time of manufacture. Fine silt of brownish colour capable of remaining in suspension with water is dissolved in water and after straining a good portion of water through a cloth the semiliquid portion or the pasty portion is mixed with the dye at the time of removing to the boiler or in the vat itself when the dye is about to be precipitated. Men who are engaged in the vat mix this with the dye by trampling and puddling well. In places where the particular coloured silt and water are not available for imparting very good violet colour in a sample mixed with silt the dye obtained from wet process and that of dry leaf process are mixed just before boiling, in the proportion of 2 adulterated wet leaf dye to 1 of dry leaf dye. The mixture when ready for the market though slightly heavier than the cakes produced out of pure dry leaf process imparts better colour (Violet) to the mix-

ture. This colour more than compensates for the deductions that will be ordinarily made for the weight disqualification and eventually the manufacturer obtains a better price for the mixture. Thus, devices have been found out to pass off bad stuff as good. The entire absence of other satisfactory tests to decide whether a sample of indigo is good or bad induces the manufacturer to adulterate. The inducement to adulterate does not stop here. As the exporters are in Madras the moffusil manufacturers are obliged to take their produce to Madras and keep them in a place until the stuff is sold. The dubashes of several firms have some recognised agents. These own some buildings containing several rooms and as soon as a manufacturer brings in his stuff one of the rooms is opened out for storing the article. This is offered free of rent. This piece of charitable act is evidently to watch the movements of the manufacturer during his stay in Madras. When the sample box is taken to a firm agent a certain price say Rs. 70 per maund is offered and if the manufacturer is willing to sell at the rate the whole lot is ordered for inspection to the godown, when the Dubash of the firm at once pronounces that the sample box and the consignment brought, differ considerably in quality and reduces the price by Rs. 10 and the manufacturer is obliged to sell it as he has to incur some expenses to get back his article and for his stay in Madras for additional number of days. Even after settling this price the Dubash rejects something like 10% of the produce saying that the cakes are broken, (பெஞ்சு) are not of good colour (செய) or are very heavy (பளுவு). All the rejected cakes are not returned to the manufacturer but are valued at a very low rate and taken by him which he subsequently sells to the firm. In addition to this the Dubash takes for every lot of eleven cakes each weighing about $\frac{1}{2}$ lb. and the man who weighs one cake. Further for every box a deduction of $\frac{1}{2}$ a lb. of dye is made for dryage and for every maund of Indigo dye from Re. 1 to 1—12—0 is deducted as office expenses, wastage etc. Before a consignment is taken to a firm or Dubash the

transactions should go only through the recognised agent known to that firm and these people charge a commission of one rupee on every maund and six sample cakes for every lot offered. Thus if all the expenses are calculated, the charges incurred by the manufacturer (before he sells a maund of Indigo) will amount to nearly 12 to 15% of the value.

Experience in Indigo manufacture reveals that the leaves obtained from the same field in different seasons do not produce the same sort of dye. During certain seasons the crop obtained from one field produces a much better dye than in the other season. Likewise the dye obtained from the first cutting differs from that of the second cutting. Plants cut at the time of flowering produce better dye than the cutting obtained after the plants have flowered. The dry leaves produce a different sort of dye from the wet process. A manufacturer or vat owner consequently will have different coloured samples and if he were to grade and assort these and take them into separate lots before the whole-sale exporter, he will be obliged to pay the charges enumerated above as many times as there are lots. To escape from this extra expenditure the manufacturers at present are obliged to take all the produce together in one lot although they may vary in quality. The adulteration is also done as a necessity so that the manufacturers may get a margin of profit to cover the 10 to 15% deductions etc., going to the Dubash in order that no loss may result to him.

From the above it will be plain that neither the manufacturer nor the wholesale exporter is profited in the concern. It may appear at first sight that the wholesale exporter is the person who is benefited the most. When the consignment exported to England is valued by experts there, it is not uncommon to hear that what was classed and sent as first sort from the firm has been classed as the second or last sort and vice versa. So in the whole transaction the wholesale exporter's profits are sometimes great while at other

times very little. But the Dubash of the wholesale exporter and the petty brokers are the persons who are profited the most as they obtain a definite commission from both the manufacturers and exporters and this swells to an enormous amount in one season.

There are several authors who have written and are still writing on the cultivation of Indigo, its improvements and production. In my humble opinion this is not what is wanted at this stage. What is wanted is more information and more light as to the methods of selling the produce. The Indigo cultivator and the manufacturer need to be shown how to obtain the largest possible returns on the article he has ready for the market. That is where he needs advice. They are at present selling wrong and are imposed upon as has been shown above by agents, brokers dubashes and merchants. The earliest way of increasing the cost is by raising the margin of profit by advising the ryots to produce articles of good quality, marketing them at the right time, at the right market and by selling directly to the consumer. Until such a scheme is satisfactorily evolved, the Indigo trade of Madras is bound to be in its present lamentable situation and the producer of Indigo crop will be in the same state telling the old story of his ancestors that by manufacturing Indigo one is liable to commit the greatest of sins.

As all of us are working directly or indirectly in the improvement of the condition of the agriculturist, let us think about and devise some measures to improve the condition of the Indigo growers and manufacturers.

***A short sketch of "Agriculture in the Pudukkottai State."**

The present agricultural status of Pudukkottai State owes its importance partly to the series of tank system of irrigation and

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partly to the natural rains received during the monsoons for the raising of crops, but the former is entirely subservient to the unsteady and varying rainfall of the state (Annual average for the last 5 years—36.72 inches).

At present there are about $4\frac{1}{2}$ lakhs of acres under cultivation, constituting wet and dry lands in the ratio of 2:3; but in a general way, the whole state can be divided into two broad heads from the topographical point of view viz., the elevated Kolatore region and the plain of Alangudi and Trimiem. As the well being of a crop depends upon the two main limiting factors viz., moisture and good sub-soil drainage, it is natural to expect good crops on the elevated region during years of good rainfall and vice versa.

For purposes of crop treatment, the soils can be divided into 4 groups (1) Red soil consisting of clay and loam (2) Black clayey soil (3) Sandy soil and (4) black cotton soil locally known as "Paruthikadu" or "Karambaikadu." The clay soil generally contain a greater or less amount of injurious salts, making crop production a difficult problem; but such soils are being reclaimed by the growing of Daincha and similar salt feeders which have to some extent raised considerably the crop yield. The presence of a limy substrata in many parts of Alangudi taluq alters the general characters of clay and sandy soils found there and they have been found to yield heavy crops under satisfactory manuring.

The climate is generally hot and dry but the state depends more for its rainfall to the north-east monsoon and a few good showers received in the south west. This opportunity is availed of for the storage of water in tanks, yendals and ooranies or small lakes, some of which are fed by torrents which carry a mass of water during rainy season, as has been said above for enabling the successful raising of wet crops. This

unsteady and insufficient water supply from tanks has subjected the ryots to face many failures; but fortunately the state is gradually overcoming this difficulty by the opening of feeders from big tanks and thus regulate the supply of water to other tanks lower down which has to a great extent ensured good crops for the last few years. Under the above circumstances, ryots are now beginning to realize the prospects of surmounting such difficulties by having recourse to the sinking of wells which will supplement the needs of crops in times of scarcity of rain-fall and place them on a safer foundation of surety of reaping a good harvest. Such activities are likely to prosper under the encouragement of the agricultural and well sinking loans which are generously offered at cheap rates of interest to the cultivators by the Durbar.

The Tillage implements continue to remain as it was in the days of their forefathers but with a few improvements being shown by the introduction of deep ploughing dry land ploughs. But any how the generality of ryots are quite persistent in closely adhering to the ancient tools without much consideration of utilizing the several economic factors such as the increasing price of cattle, production of more paying crops suited for the market &c., to their best advantage, by using improved implements for deep cultivation and reap the resultant effects of such attempts. In spite of such persistence, the agricultural department has been successful in introducing some improved implements such as Massey's and Meston's types of iron ploughs amongst the educated land-holders at the instance of which some ryots are trying to take up to them. With all this, the rural mass look upon such implements with high suspicion and fear as regards the suitability of their cattle for such implements. Hence the real work of the agriculturist consists in the evolution of such types of improved ploughs satisfying the requirements of both the wet and dry land cultivators, hand in hand with the improvement in live stock.

The cultivated area can be divided into wet, dry and garden lands of which the last viz., garden cultivation being in a state of rapid and steady advancement.

Taking the wet land cultivation, we find paddy is universally grown by the ryots, the majority of wet lands being single cropped. Occasionally we find paddy being rotated with ragi in years of favourable rains and gingelly in times of scarcity. Under major and minor irrigation tanks, paddy crops of longer and shorter duration are raised.

The Nursery is being raised by both wet and dry systems during the months of August and September (generally at the local seed rate of 5 to 6 M. M. per cent which has been considerably reduced by the introduction of single planting system in many parts of the state) and the transplanting being pushed on so as to complete it before the middle of October in order to avoid the attacks of Anaicomban and Thandeethu pests which are popularly believed to pest the crop transplanted after that period reducing the yield enormously. Taking both the crops even supposing they are attended with the attack of pests, the earlier transplanted crop does not suffer so much as the late one. In years of precarious north-east monsoon rains, only short duration crops (3 to 4 months varieties) are raised but late transplanting being preferred i.e. after the middle of November. It has been the actual experience of the ryots that the early raised Samba seedlings are stronger than the later ones by virtue of which the earlier ones are not subjected to the attack of the two pests both in the nursery and in the field as the late one. In addition, it is found that the better manured crop, resists the disease more efficiently, than the deficiently manured one, yet, even such experiences of ryots have to be systematically tested at least for a few years in a scientifically controlled farm under expert supervision to corroborate the experiences of ryots. Apart from the various sources of reduction of the crop yield, the avaricious nature of

many ryots under minor tanks by putting in 6 to 8 months' varieties when the water supply could only grow a short season crop (3 to 4 month variety) to perfection, contribute to the ruinous effect felt by the ryots very miserably. Such bitter experiences of difficulties of their own making are likely to teach them the necessity of preferring short duration crops to long duration ones under such circumstances.

As the major portion of irrigated ragi cultivation is being carried on in wet lands only, I think it would not be out of place here to refer to the improvement in ragi cultivation which has very successfully and rapidly begun to spread viz., transplantation of ragi under ridge and furrow system, now locally known as "Kathiri-par-keppai" in a few villages of my jurisdiction as a result of continuous efforts in this direction for the last seven years followed by a majority of ryots in those villages. The ryots of the surrounding villages also have become quite convinced of the various advantages of ridge and furrow system (for ragi and cholam) over the local bed system. Hence there is every scope of a very popular spread of this improvement on increasing areas year by year in future under the departmental encouragement.

The manuring of wet lands is of a rudimentary character, not on account of the ryots' ignorance but because of the non-availability of any satisfactory quantity of green leaf and cattle manures which are supposed to be of high manurial value in the profitable production of wet crops. It is under such circumstances that the department has been of immense service to the ryots in pointing out to them, the profitable nature of raising green manure crops at a cheap cost and ploughing them in to ensure a good yield. Within recent years, this department has been successful in expanding the growing of green manure crops on increasingly wide areas in wet lands, the furtherance of which

is aided by the opening of the farm seed store for controlling the distribution of green manure and other seeds of local importance.

Achukkattu lands :—The vanavari or rainfed achukkattu lands of the state are generally manured by penning sheep on the land before the preparatory ploughing and occasionally with rotten cattle and leaf manures in any available quantity and cultivate with (1) Puluthikar, (2) Kuliyidichan, (3) Manakathai (4) Kuthalai which are the most renowned drought resisting dry paddies in the state. The last named viz., Kuthalai has been even sown with the dry varagu crop in slightly low lying dry lands in some parts and found to give a sure and pretty good yield. As these 4 varieties are found with ryots only as mixture of two or more varieties, selection of pure strains of each of these 4 varieties followed by careful annual seed selection and distribution of such select seeds on a popular scale to meet the ryots demand, combined with improvements in cultivation and manuring, are likely to effect a great revolution in the dry paddy cultivation and to prove as a great boon to the state ryots and of achukkattu lands in particular.

The garden cultivation in the state is in its primitive condition but gradual advancement is being evinced year by year by the sinking of wells in several dry tracts of the state. It is well known that the uncertain character of dry crops does not at all satisfy even the vital needs of ryots. Hence in recent years, the touch with the immigrant garden cultivators of other districts has created our enthusiasm at seeing the decided superiority of garden cultivation amongst the resident ryots of the state as a result of which good garden crops are seen in several parts of the state. Now a further step in their advancement in this direction can be effected under the departmental guidance to grow well-paying industrial crops such as plantains, tobacco, sugarcane etc.

As for the dry lands, it can be stated that the general character of the soil is predominantly red loam which makes it quite possible to grow groundnut of a superior quality on an extensive scale. Red gram and other pulses and cereals come next in importance to groundnut. The manuring of drylands is often resorted to especially in the cultivation of Groundnut, Redgram Choram, Ragi crops as they are better paying than others. There is a good scope for improvements in the better cultivation and manuring of drylands.

Condition of ryots. Comparatively speaking the average holding of a ryot is decidedly very small which consists of 1 acre and 66 cents i.e., 10 Nedugais (1 Nedugai=50 kulis=16½ cents) of wet lands with about an acre of dry land for which he maintains a pair of cattle worth about 30 to 50 Rs. The ryots are mostly old fashioned and illiterate which makes the possibility of improvement in the state agriculture a course of slow progress. Many difficulties are experienced in convincing the ryots to take up to improvements suitable to their local conditions which can only be overcome by presenting to the ryots in effectively appealing and applicable ways after thoroughly grasping the local conditions of the place. But such improvements can have rapid strides amongst the rural mass provided education enlightens them tolerably to realize the prospects of the suggestions presented to them. Herein lies the co-operations of the educational and agricultural departments. Hand in hand with the enlightening of the mass, the opening of several local demonstration farms in rural parts will prove of high instructive value to the brother ryots. As an instance of their illiteracy, we can quote the growing of a long duration paddy in the place of a shorter one without understanding the crop requirements. This is their experience in wet lands. On the other hand, the uncertainty of dry crops makes their position still more precarious. Under such calamities, the ryots in order to satisfy their needs in life are often driven to the necessity of borrowing money from the professional money lenders who extort exorbitant rates of interest, thus aggravating the situation still more deplorable.

In addition to this enhanced rate of interest, the money lenders gain a better advantage at the expense of the ryots welfare by forcing out of them the newly harvested crop in favourable years leaving them adrift. All the above mentioned factors contribute in producing tangible effects by converting their lives instead of one of happiness and prosperity to one of pauperism and misery. The solution of this problem touching the very core of national progress consists in the establishment of co-operative credit societies which undertake to fulfill the various activities for the betterment of the ryot population. This fact has engaged the attention of the Durbar and a remedy has been sought for by the organization of co-operative credit societies in many parts of the state, which has, I am glad to say, altogether turned the tide. Now co-operative society has been found to be an important organ for the agricultural development of the state. Through this agency, the improvement in the live stock is being effectively worked out to the best advantage. The possibility of introducing improved implements, good seeds, manure and similar improvements, will it is hoped be gradually worked out by co-operation in agriculture. Gentlemen, I can say that the state has very many natural facilities peculiar to it such as good traffic road &c., &c. which can be converted into one of practical utility which will all tend to ameliorate the present backward condition of the agriculturists into one of life long happiness and prosperity to the state.

*The influence of the Palur Agricultural Station on the Agriculture of the South Arcot District.

The subject itself will amply reveal to you the fact that the contents are in no way original but are mostly extracts taken from the official records. The only claim for this liberty on my part lies in the fact that I was the Farm Manager of the Palur Agricultural

*Paper by Mr. S. Subramania Ayyar, Farm Manager, Central Farm, Coimbatore.

station for a period of over 8 years from 1906-1914 and that I had the opportunity of being intimately connected with the introduction and extension of the activities of the Agricultural Department in this and its neighbouring districts during that period.

The object of my essay is, only to bring in a concise form what an agricultural station has done to benefit the farmers and what it can do.

Before I proceed to speak on this subject, please let me give you a brief account of the agricultural practices of the district when the Palur agricultural station was founded.

The agricultural practices of a country depend upon its physical features. South Arcot is one of the Coast districts bordering the Bay of Bengal and it is for the most part a flat plain sloping very gently to the sea on the east. There are only a few rivers which flow in almost parallel courses and empty into the Bay of Bengal. The soils of the district comprise 30 per cent. of Black soil, about twice as much of red soil, and 30 per cent. of sand. The district may therefore be roughly divided for agricultural purposes into three tracts.

1. The narrow strip of low land along the coast consisting of sand and sandy loams. This is largely used for the cultivation of Casuarina and Cashew-nut trees. This may be considered agriculturally unimportant.

2. Next comes the red soil tract occupying about $\frac{1}{3}$ rd the total area of the district. It is on this soil the dry and garden crops are raised.

3. And lastly the Black clay tract covers about a third of the district where wet cultivation is carried on. As this is an east coast district, the rainfall varies directly with the distance of each locality from the coast. The fall in stations on or near the coast is about 55 inches and is considerably heavier than that in places more centrally situated where the average rainfall is about 45 inches. This again is larger than the supply received in the inland villages, i. e., about 40

inches. The reason for this is evident. Over half or nearly $\frac{2}{3}$ ds of the rainfall is brought by the north-east monsoon from the direction of the sea and is deposited in the coast taluks. The south-west monsoon which brings almost all of the remaining annual fall is on the other hand slightly heavier in the inland taluks which it first reaches than in the central or coastal parts of the district.

Depending on the rainfall, the agricultural year may be divided into 4 seasons. Dry weather from January to March getting on the average about 2 to 3 inches. Hot weather months, April and May, receive a little over one inch. The South west Monsoon, June—September receives about 12 to 15 inches. The North east Monsoon October—December when an aggregate rainfall of over 30 inches is usually recorded.

The wet lands have two seasons May to August, for the first crop and September to February for the second crop. While sugar-cane is usually planted as soon as the channels are opened i.e., in April or May and under wells about the same time. Dry land under well irrigation need not depend upon the rainfall and is cropped throughout the year. Of course the sowing season is so arranged as to avoid rainy weather at the time of harvest. Purely rainfed dry lands have only two seasons as no crops can be raised during the dry and hot weather months. However with the few showers during these months preliminary cultivation operations start.

Please permit me to say a word here about the farmers of the South Arcot District. This is one of the densely populated districts in the Presidency. The farmers are mostly Reddiars, Nayanars and Odayars corresponding to Nayadus and Gounders of the Coimbatore district. The holdings are usually small and very intensive cultivation is resorted to to maintain the grain supply. In these rainfed dry lands the ryots raise a grain crop for their food and an industrial crop to help their purse. The grain is usually Cumbu and sometimes Chulam and the industrial crop is invariably groundnut. This kind of mixed cropping in the dry lands forms a good rotation. Cumbu is

a seventy to eighty days crop and groundnut is a five months variety. Cumbu is sown first, weeded and hoed twice and when the crop is about thirty to forty days old, the groundnut is dibbled in. The young groundnut grows healthily under the shade of cumbu undisturbed by the Surul—a tiny leaf caterpillar, which causes a deal of damage specially to rainfed groundnut. The yield of the quick growing Cumbu is not lowered either. I will no more trouble you with figures except in this one instance. You may take the money value of the Cumbu to be Rupees twenty and of groundnut rupees seventy five. Total income of Rs. 95 deducting expenses for raising both the crops an average net income of about Rs. 50 or 65 per acre is obtained.

Thus solely with the aid of the rains the ryots take two crops in six months a food crop and a money crop. They rotate their crops with a cereal and legume; they give a preliminary start to one and protect the other in the young stage from its terrible enemy and they get a fairly good profit. What then such farmers are in need of? What sort of help they require? What sort of improvement can be effected? What really can the department do here? These are problems for us to solve. The solution is not far to seek.

The people were not satisfied with this income. They became greedy. They wanted more money. They began to bring into cultivation all arable lands, apparently a right thing to do. The virgin land gave them what they wanted to begin with. They got good yields for some time and after a few years the yield decreased and they got less profits. What manure was available they distributed over a larger area. The land did not get back in return in the shape of manure proportionately to the crops harvested. The land naturally got exhausted. The farmers then devised means. Instead of raising two crops a cereal and a groundnut, they were satisfied with growing one crop. Their choice fell on the money crop of groundnut. From their net profit out of this crop, they had to buy their food. While their profits thus decreased the area under groundnut increased rapidly until in 1899 to 1892 the acreage was 150,000.

There was a sudden decline. The lowest points being reached in 1887-1898 when the acreage was only 52,000 acres. An enquiry was instituted in 1889 by Government to see if it would be possible to infuse life into the decaying industry by the introduction of new varieties. But it was then found as detailed in Bulletin No. 38 of 1900 that this change of seed had already occurred at any rate in the neighbourhood of Panruti and that the local kind had been completely replaced by a new one 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 reached dimensions far beyond anything dreamt of before and the area rose from a little over 52,000 acres in 1897 to 1898 to about 300,000 acres in a few years. Up to 1897 to 1898 South Arcot accounted for 60% of the acreage under groundnut in the Presidency. During the depression of 1897 to 1898 this percentage fell to 50. After a revival, the percentage rose to seventy and even to seventy five showing that South Arcot is peculiarly suited to groundnut export. Everyone grows groundnut and every bit of land is cultivated with groundnut. You will realise the pitch the groundnut cultivation reached when I quote what Dr. Barber says in his first report on the Palur Agricultural Station. "On the top of a low stony hill south of the Gadilam within a mile of the Farm, an annual crop of groundnut is obtained; in fact to quote the expression of a 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." To continue to quote a few more of Dr. Barber's words "With this state of affairs it is natural that good agricultural practice is frequently set at naught, well known and approved systems of rotations are ignored, continuous cropping on the same ground especially by small holders is frequent. 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." At this juncture i.e., about the year 1905 the

ryots stood in urgent need of help and the Government immediately founded the Palur Agricultural Station with well-defined objects. One of them is that it was to be devoted to the general study and to promote the improvement of this industrial groundnut crop including the collection of few varieties, the examination of the local methods of cultivation and especially the diseases affecting the crops.

Accordingly all the varieties were collected from the best groundnut growing countries of the world, tried and compared side by side with the local Mauritius groundnut. A consignment of nuts was obtained from Mauritius in order to determine whether the originally introduced Mauritius seeds had deteriorated. A set of varieties grown on the Farm is being analysed year after year. The object of continuing the cultivation of the promising varieties is to acclimatise them, "with a view to being prepared to put on the market for distribution purposes a variety which has proved a success should the Mauritius variety show signs of deterioration as did its predecessor local groundnut."

Thus far three varieties namely West African, Barbadoes from Ceylon and Madagascar have been found to be highly promising as a rainfed crop, surpassing local Mauritius. Amongst the promising varieties suitable for cultivation as irrigated crop are Madagascar, Sengal and West African. Cereal rotation experiments are in progress. The object is to ascertain what cereal crops may be grown most profitably in rotation with or mixed with groundnut and their place in the rotation.

In the irrigated area, Cambodia was found to be a profitable rotation crop with Ragi-groundnut. Groundnut seed selection was taken on hand and large quantities of selected seeds were supplied to ryots. Bulletins and pamphlets on groundnut cultivation were issued. A large number of improvements have yet to be effected. The chief of them is the marketing of groundnut. As was pointed out yesterday by the President, the marketing is so very defective that the consignment of kernels shipped abroad gets rancid before they reach their destination. The cause is due to bad handling after

lifting. Owing to want of sufficient machine shellers, the damping of groundnut for hand shelling as is practised at present is inevitable. This is now engaging the attention of the Department.

Other objects with which the agricultural station was started were also kept in view, namely to introduce superior varieties of sugarcane. A good deal has been done in this direction. Several promising Mauritius varieties were first brought from Samalkot to which Barbadoes, Java and Fiji varieties were added as they proved successful in other agricultural stations. Red Mauritius which found favour with the ryots and best suited to local conditions was widely distributed free during the first two years of its introduction. Red Mauritius gives high yields and has entirely ousted Namalu, the local cane variety. This work of distribution of cane setts has been very largely taken over by Messrs. Parry and Co., Nellikuppam to whom our thanks are due as they are better able to cope with the increasing demand, while the agricultural station is devoting itself more to varietal tests.

The activities of the Department were also well up in other directions:—

Paddy:—The introduction of economical planting and reduction of seed rate in paddy was met with success. The improvement did not end here. Unit selections in local Garudan Samba paddy were made and tested and a strain named "Ramagarudan Samba" was found to yield 25% more than the local variety. It is no wonder if the strain will entirely replace the Garudan Samba in the course of a few years as was the case with cane.

Green manures:—Several green manures were tried on the agricultural station and suitable manure seeds were distributed to the ryots. Over 150,000 lbs of seeds have reached the ryots' hand in the course of 5 years.

As regards implements, suffice it is to say that improved implements at low prices were made and distributed to ryots.

Improved country ploughs costing Re. 1 each and Scipd ploughs costing Rs. 3—8—0 each numbering about 180 were supplied from the Palur Agricultural Station. A cultural implement known as Sampson's harrow costing Rs. 7 found favour with the ryots and 100 of them were supplied. These are not patents and the ryots are at liberty to copy these and make their own. The ryots had made these implements for themselves. This accounts for the small number distributed from the Palur Agricultural Station. The ryots have already begun to use the recently introduced Monsoon plough and 30 of them have been sold out. A good number of bulletins and leaflets on all these implements have been printed in vernaculars also. The leaflets are widely distributed free. The influence of the Palur Agricultural Station has thus raised the income of the farmers, has roused them from their slumber, and will, I hope, keep them awake to take the improvements which are yet to be handed over to them. The Agricultural Station did not confine itself to South Arcot District alone. It extended its influence a good way beyond its limits. Amongst others, I should like to make mention of the Kumbakonam and Madura District Agricultural Associations which sought the aid of and fully utilised the Palur Agricultural Station. Both the Associations trained one of their men at the station. Not satisfied with his help, Kumbakonam Association approached and requested the Government for trained deparmental officers one of whom was eventually deputed to this District. They were not contented though. They wanted an agricultural station to suit their local conditions and Manganallur Agricultural Station was started. The Kumbakonam agricultural Association is now taking advantage of this station and is effecting all improvements possible in their local agriculture. While such being the case, the District Agricultural Association, Coimbatore, does not seem to take advantage of the Central Farm situated in its own District and so close the town. If one of its members were to ask me, out of curiosity, what he can see and

learn in the Central Farm at present, I shall welcome him and his friends interested in the improvement of their farming to see to day, our thin paddy nurseries dry and wet, for about 40 acres sown at the rate of 16 lbs of seed to transplant an acre; to see the good work of small iron ploughs used for puddling our paddy land; to see the beautiful growth of the green manure crops of Daincha and Sannhemp raised over a large area; and to see the excellent growth of young cane varieties in the Wet Land. In the garden land, they can see the uniform good stand of Chitrai Cholan yellow and white on a large area. Class III students who had been to Tiruppur for the Cattle Show were telling me that they had not seen a single crop similar to one on the Farm. The uses of interculturing implements Dantulu and Junior Hoe in the drilled fields of red gram and castor can be demonstrated. They can see good fodder crops of cholam and guinea grass regarding which an article has been published in the current agricultural calendar. They can also see the cattle sheds and copy how urine is preserved. I may here mention that the Raja of Kollengode was so well impressed with the Cowshed that he told me he will have a similar one constructed for his cows as soon as he returns home.

I hope and wish the members of the Coimbatore District Agricultural Association will soon follow their brethren of Kumbakonam in effecting Agricultural improvements amongst the ryot population. The only possibility of rapidly extending the sphere of usefulness of this Department is by co-operation and co-operation is still in its infancy, requiring a good deal of organisation and development to serve the ryot population in effecting agricultural improvements.

***Economics.**

The Principal of the College has asked me to say a few words to this Conference, and to explain what Economics is, and what

*Paper by Dr. Gilbert Slater, Prof. of Economics, Madras University.

it has to do with the subject which we have been discussing heré. Economics is the science which deals with the ordinary business of life, and the object of studying Economics is to discover by what measures we can best promote the general well-being of the population. You can therefore well imagine that every paper which has been given and every speech which has been made is a contribution to the study of Indian Economics; and that therefore my business has been to attend here as a learner. The question then arises whether I can be a teacher as well as a learner; whether, in fact, there is anything which the economist has to say to the agriculturist which will be of value to him.

One thing, I think, the economist can well do at the present time in India. He can warn people against the influence of false economic theories. Because, just as Moliere's hero talked prose for forty years without knowing it, so in all discussions of public policy people are apt to talk Economics without knowing it, and to be influenced by all sorts of economic theories without knowing where those theories came from or whether they are valid. This is specially the case in India, for, just as good Americans when they die are said to go to Paris, so bad economic theories when they become obsolete in England come out and have a second life in India.

The particular economic theory which I have in mind is the false economic theory that the State should not interfere in industry and should not regard itself as responsible for agricultural and manufacturing progress. The true theory is that the State should not interfere in these matters without good and sufficient reason, and that it should not hurry to do work of this nature without first ascertaining that it will not be efficiently done by private enterprise or voluntary organisations. When these are lacking the State must be prepared to fill the gap. Indian opinion is, I am sure, entirely right in demanding a great extension of activity on the part of the Government in the

direction of improving education, sanitation, development of roads and other methods of internal transit and transport, improvement of agricultural methods, and development of industries.

But while the economist has to warn Government against the exploded economic theory of "laissez faire," which forbids the extension of its activity, he also has to warn Indian opinion against the corresponding economic fallacy that taxation is an evil which ought to be reduced to the lowest possible dimensions. Extension of Government activity demands increased expenditure; increased expenditure demands increase of revenue; increase of revenue, not always but very frequently, demands increase of taxation. Whenever by an increase of taxation which may be measured in annas, an economic advantage can be obtained by the people which is measured by something like the same number of rupees, then the increased taxation is a benefit to the people. We have had examples brought before our attention during this Conference illustrating this. We see the enormous benefit which the ryots who cultivate the Karungani variety of cotton have derived from the work of the Department of Agriculture. Even greater economic gains have been obtained by the adoption of single seedling transplantation of paddy. These are only examples of an enormous number of possible ways in which a government more liberally supplied with funds than the Madras Government is at present, could promote the economic well-being of the country and its people. It is, therefore, the business of the economist, on the one hand to point out the readiest means of increasing the revenue; on the other hand to point out the leaders of opinion in India that an increase of taxation is not an evil, but should be welcomed, whenever the money so raised is wisely spent. For in that case payment of taxes is the most profitable investment possible for the taxpayer.

Winners of Races, &c., College Day Sports, July, 1916.

Hundred yards Race—11½ sec.	...1. K. S. Ramana Rai. 2. S. Dharmalingam. 3. Samuel Nallathambi.
Children's Race (Boys over 7)	...1. Kasturi Naicken. 2. Narayanasami.
Long jump. 19'—5½"	...1. K. S. Ramana Rai. 2. S. Dharmalingam. 3. Samuel Nallathambi.
Putting the shot.	...1. K. S. Ramana Rai. 2. Samuel Nallathambi.
Sack Race.	...1. K. S. Ramana Rai. 2. E. S. Visvanathan.
Quarter Mile Race—93½ sec. (Last years record 51½ sec.)	...1. Dharmalingam. 2. Samuel Nallathambi. 3. R. Venkataraman.
Greasy Pole for coolies.	...1. Castemen—Marudachalam. 2. Pallas—Angan,
Throwing the Cricket-ball—79 yds. 7 in.	...1. K. S. Ramana Rai. 2. M. Anantam.
Children's Race 50 yds. (Boys under 7)	...1. Doraippan. 2. Sukkiappan.
Half-mile Race—2 min. 44½ sec. Last year's record—2 min. 39 in.	...1. S. Dharmalingam. 2. R. Venkataraman. 3. K. K. Subramanian.
Do. do. For Peons	...1. Perumal. 2. Subbayan.
Children's Race—100 yds. (Girls over 7)	...1. Lakshmi R. V. 2. Godavari S.

High Jump—4'-10" (Last year's record 4'-10")	...1. K. S. Ramana Rai. 2. Samuel Nallathambi. 3. Kuppusamy.
Slow Bicycle Race. (Staff, Students & Ex-Students).	...1. K. Rangasamy Pillai. 2. U. Vittal Rao.
Hurdle Race—20½ sec. (Last year's record—20 sec.)	...1. S. Dharmalingam. 2. K. S. Ramana Rai.
Children's Race—50 yds. (Girls under 7)	...1. Minammal. 2. Rajamoni.
Relay Race—6-56½ Class II. (Last year's record—7 min. 10 sec.) (Staff Students & Ex-Students.)	... Venkatesha Iyer. Samuel Nallathambi. Chellam Iyengar. Sankara Iyer. Fernando. Muthusamy. Balaji Rao. Anantham.
Half-Mile Race—2'-22½" (Other Institutions only) (Last year's record 2 min 28 sec.)	...1. Ratnavelu, Coimbatore College. 2. Armstead, Stanes High School. 3. Eling Do.
Pole Jump—6'-1"	...1. Samuel Nallathambi. 2. K. S. Ramana Rai.
One Mile Race—5'-51" (Last year's record 5'-25")	...1. E. S. Visvanathan. 2. S. Ramachandran. 3. R. Venkatraman.
Obstacle Race.	...1. S. Kuppusamy. 2. K. S. Ramana Rai. 3. E. S. Visvanathan.
Cross Country Race.—26 min. 32½ sec. (about 4 miles)	...1. E. S. Visvanathan. 2. K. Balaji Rao. 3. S. Ramachandran.

Tag of War. (Teams of eight, Staff Students & Ex-Students)	...Central Farm team consisting of Messrs. R. C. Wood, A. Carruth, S. Subramania Iyer, A. J. Wilson, K. Sankaranarayana Iyer, Laxminiah Naidu, Kunhi Kutti, P. S. Sarma.
Championship.	...K. S. Ramana Rai.
Consolation medal awarded by Messrs. Pourwal & Co., Bangalore.	...S. Dharmalingam.

Report of the working of the Madras Agricultural Students' Union for the year 1915-16.

The working committee begs to submit the following report on the working of the Union during the year 1915-1916.

When presenting the report last year, we expressed the hope that the present terrible War would come to a successful end and that we would meet this year in an atmosphere of peace and joy; but contrary to our expectations, the war is still raging and we earnestly pray for a victorious peace. Several members of the Union have from time to time contributed their mite towards war expenses and we are glad to state that one of our Honorary Members, Mr. E. Ballard, has recently joined the forces. We wish him god-speed and a safe return to his labours.

Obituary.

We very much regret to record that during the year the Union lost two of its Honorary members—the late Dewan Bahadur M. Adinarayanaiah and the late Rajah of Ettiyapuram and one of our old students the late Mr. G. Kamatchi Rao. The former two took much interest in the welfare of the Union. The late Mr. Kamatchi Rao was a practical Agriculturist and did very useful work in the reclamation of alkaline lands under the Periyar.

Membership.

The Union is now in the sixth year of its existence and there has been during this period a steady progress in all directions.

During the year under report, there has been an addition of 45 members to the Union, thus bringing up the membership to 355 as against 301 last year; we have thus on our list:—

Patrons	...	...	5.
Benefactors	...	...	1.
Honorary Members	...	...	52.
Associates	...	...	3.
First Class members	...	...	63.
Ordinary members	...	...	203.
Total	...	...	355.

The committee has great pleasure in announcing that Rajah Vasudeva Rajah of Kollengode, C. I. E., has kindly consented to become a patron of the union by paying a life subscription of Rs. 100/- We take this opportunity of thanking him for his generosity and at the same time congratulating him on his well deserved title.

The Hon'ble Mr. E. F. Barber, representative of the planting community in the Legislative Council, M. R. Ry. T. A. Ramalinga Chettiar B. A., B. L., Vice-President, District Agricultural Association, Coimbatore, and Mr. Allan Carruth, the Deputy Director of live-stock, have kindly consented to become Honorary members. We earnestly hope for their co-operation and advice specially in connection with the conduct of the Journal.

The Journal.

One of the most arduous tasks of the working committee is the conduct of the Journal of the Union.

The activities of the Union were first published in the form of a year book. With the increase in its activity the year book gave place to a quarterly Journal, which was subsequently made monthly. The annual subscription till recently was Rupee One. In spite of the fact that it is run by a body of honorary workers dispersed throughout this Presidency and as such costs nothing in editing and management, it was found to be working at a loss and it was therefore resolved during the last conference to raise the annual subscription to Rs. 2/- and this brought about a decrease in the number of subscribers by about 40. The Journal is, however, gaining in popularity and new subscribers are coming in, so that we have this day 500 subscribers as against 490 of last year. We owe an apology to our subscribers for the very late issue of the first four numbers of this year's Journal but this was owing to the outbreak of plague on the estate and at Coimbatore and the consequent unavoidable disorganisation of our work.

The committee is very grateful to M. R. Ry., T. V. Narayana Rao for kindly accepting the honorary work of Editorship at a time when it was impossible to find a successor in place of Mr. M. R. Ramaswami Sivan. We are also thankful to Mr. K. N. Swaminathaiyer, Proprietor of the Literary Sun Press, Coimbatore for the willingness and promptness with which he has executed the work entrusted to him.

Our thanks are also due to the contributors and subscribers of our Journal for their willing help but at the same time we would like to point out that we expect from our members better co-operation so that the Journal may well serve its purpose. Having very little spare time outside our legitimate duties, we cannot do full justice to the work and we hope that the subscribers will continue to overlook our shortcomings.

College Day.

The fifth College Day and Conference were held on the 10th to 12th July 1915 and were presided over by the Honb'le Mr. E. F. Barber. A full account of the celebrations and proceedings has been published in the September issue of our Journal. The competition for Sports was characterised by the healthy feeling of emulation without envy and rivalry without ill-feeling. Our thanks are due to Mrs. Cumming for kindly giving away the prizes on the Sports day. The committee begs to tender its heartfelt thanks to the Honb'le Mr. E. F. Barber for presiding at both the sessions of the Conference and to Messrs. G. R. Hilson, A. K. Yegyanarayana Ayyar, Muhammad Miran Sahib, C. N. Krishnaswamy Ayyar, I. Raman Menon, T. V. Rajagopalachari, V. Muthuswami Ayyar, D. Balakrishna Murti and Rai Saheb Seetarama Ayyar for kindly contributing papers. We also thank Messrs. R. Cecil Wood and D. Ananda Rao for being "at home" on the College day. The committee begs to acknowledge with many thanks the contributions in money and otherwise, it received from various gentlemen here and else-

where. A list giving the names of those who kindly subscribed over one rupee towards the College-day expenses is published at the end of this report.

Prize Essays.

Mr. K. Ramasastrulu Naidu, B. Sc., once again offered a gold medal for the best essay on "the relations which at present exist in this Presidency between farmers and their servants and suggestions for their improvement from the point of view of both parties." This medal is won by Mr. G. Jogi Raju for the second time.

Mr. T. S. Venkatraman B. A., offered a gold medal for the best essay on the "sugarcane crop, its characters, limitations and possibilities." Mr. S. Daniell of the Mysore Agricultural Department has been awarded the medal. We congratulate Messrs. G. Jogi Raju and S. Daniell on their well deserved success. Though we announced the subjects for competitions as early as last November we regret to note that the number of the competitors was very few. Though few in numbers, in the opinion of the judges, the essays were considered good and thoughtful and well worth the medals. The committee hopes that in future years, there will be a larger number of members competing for the essays. The committee's warm thanks are due to the following gentlemen for judging the essays: Mr. D. T. Chadwick, Dr. C. A. Barber, Dr. Coleman, The Hon'ble Mr. K. R. V. Krishna Rao, Mr. R. Cecil Wood, M. R. Ry. Bao Bahadur C. Hanumantha Goud and Messrs. Neilson, Hilson, and Ananda Rao.

Finance.

The financial statements giving details of receipts and expenditure under different heads—Permanent fund, College day and Journal—are printed in the appendix.

The progress of any Union is judged by its popularity, financial stability and business capacity. That this Union is popular is shown by the interest evinced by the landed aristocracy in joining us as patrons, benefactors and associates, and by voluntary help rendered to it by all the officers of the Department. The statements appended will show that we can claim to be financially sound. The success of the Union could not have been what it is but for the co-operation of members, the tolerance of its shortcomings by the landed aristocracy and other subscribers of our Journal and the willing support given to it by the various officers of the department.

The Union is under contemplation to lend Rs. 400/- to one of the promising students of this college to continue his studies. The committee hopes to extend its activities in similar directions.

This year the re-organisation scheme of the department was brought into effect. We heartily congratulate Messrs. J. Chelvaranga Raju, M. R. Ramaswami Sivan and D. Balakrishna Murti on their well deserved promotion to the Provincial grade.

The thanks of the committee are due to Mr. D. T. Chadwick who is now on deputation to Europe for his kind sympathy towards the aspirations of the Union and to Mr. G. A. D. Stuart for kindly deputing a large number of Farm officials to attend the College Day.

The committee cannot close this report without acknowledging the help rendered to it by the Principal, Mr. R. Cecil Wood under whose able guidance the Union is sure of a bright future.

K. KRISHNAMURTI RAO,
General Secretary.

APPENDIX. **Union Account for 1915-16.**

Dr.	RECEIPTS.	Amount.		Total.	Cr.	EXPENDITURE.	Amount.		Total.
		Rs.	A. P.				Rs.	A. P.	
	Capital at the beginning of the year								
	To permanent fund account 1298 0 0					By temporary advance to College day 1916	200	0 0	
	Recovered from Journal account 400 0 0					By temporary advance to Printer	70	0 0	270 0 0
	Recovered from College day account ...200 0 0					Invested in the Urban Bank capital 1450 0 0			
	Recovered Interest on account of capital 168 3 0	1898	0 0			Interest 260 1 9	1710	1 9	
	Receipts during the year					Invested in Savings Bank	400	0 0	
	Journal account 40 15 0					Petty cash on hand	43	1 7	
	College day account 14 2 7								
	Permanent fund " 210 0 0								
	Interest on the amount invested in bank 91 13 11								
				356 15 6					
	Grand Total.	...		2423 3 4		Grand Total.	...		2423 3 4

Permanent Fund Account.

RECEIPTS.	Amount.		Total.	EXPENDITURE.	Amount.		Total.
	Rs.	A. P.			Rs.	A. P.	
Donations from Honorary Members 1914-15 440 0 0				Furniture purchased up to 1915	29	0 0	
During 1915-16 15 0 0				Purchase of hurdles, flags drama articles etc., in 1915-16	71	0 0	100 0 0
Subscriptions from: -	455	0 0		Transferred to the capital account up to 1915 June	1898	0 0	
Patrons 1914-15 350 0 0				Balance on hand now transferred to the capital account...	210	0 0	2108 0 0
1915-16 50 0 0							
Benefactors 1914-15 100 0 0	400	0 0					
Associates 1915-16 22 0 0	100	0 0					
1st class members	22	0 0					
1914-15 359 0 0							
1915-16 56 0 0							
Ordinary members	415	0 0					
1914-15 678 0 0							
1915-16 138 0 0	816	0 0					
Grand Total...	...		2208 0 0	Grand Total...	...		2208 0 0

Journal Account 1915-16.

Receipts.	Amount.	Total.	EXPENDITURE.	Amount.	Total.
	Rs. A. P.	Rs. A. P.		Rs. A. P.	
Subscriptions by V. P. P. ...	693 6 0		Last year's deficit	178 9 7	
" by M. O. & cash ...	279 8 0	972 14 0	Printing charges	604 1 0	
Advertisement charges ...		62 0 0	Establishment	80 15 6	
Interest on the amount advanced to the printer ...		9 1 0	Postage including V. P. P. ...	130 2 0	
Miscellaneous collections ...		2 8 0	Stationery	5 15 0	
			Lighting charges	3 8 11	
			Miscellaneous charges	2 4 0	1005 8 0
			Balance transferred to capital account	...	40 15 0
Grand Total...	...	1046 7 0	Grand Total...	...	1046 7 0

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Detailed College Day Account, 1915.

Receipts.	Rs. A. P.	Expenditure.	Rs. A. P.
Donations for the Munagala and sugarcane prize medals. ...	110 0 0	Last year's deficit	4 4 7
Realised by sale of rosettes. ...	...	Stationery and Typing charges	11 4 0
Miscellaneous collections by sale of locks, lamps, etc. ...	70 0 0	Printing charges	18 8 0
Subscriptions for the college day from Gazetted Officers 142 8 0	8 8 0	Postage, and Telegram etc.	15 13 6
Others 51 6 0	...	Cost of making, badges, rosettes etc.	39 2 10
Students 84 8 0	...	Preparation of ground for sports, erected waters for competitors etc.	32 4 6
Outsiders 85 0 0	363 6 0	Munagala & sugarcane prize essay medals	118 1 0
Entrance fee for sports from students ...	4 1 0	Prizes and medals for winners in Sports...	158 1 0
		Photos and framing charges	12 0 0
		Students' entertainment	65 3 6
		Refreshments	55 9 6
		Miscellaneous	4 0 0
		Lighting charges	7 8 0
		Balance transferred to the capital account	541 12 5
Grand Total...	555 15 0	Grand Total...	555 15 0

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Checked and found correct.
(Sd). K. RAGHAVACHARY.

(Sd). K. RAMAYYA,
Treasurer.

**Subscriptions of over One Rupee received
towards the expenses of
the College Day celebrations of 1915.**

	Rs.
1. Mr. Chadwick, D. T., M. A., I. C. S.	30
2. „ Wood, R. C., M. A.	30
3. „ Steel, A.	15
4. „ Ballard, E. B. A.	10
5. Dr. Barber, C. A., Sc. D.	10
6. Mr. Fletcher, T. Brainbrigge, F. E. S., F. Z. S.	10
7. Dr. Harrison, W. H., Sc. D.	10
8. Mr. Hilson, G. R., B. Sc.	10
9. „ Krishna Ayyangar, N.	10
10. „ Krishnan Nayanar, Vengail K.	10
11. „ McRae, W., M. A., B. Sc., F. L. S.	10
12. „ Parnell, F. R., B. A.	10
13. „ Ramabhadra Nayudu, V. Hon'ble Dewan Bahadur.	10
14. „ Ramalingam Chettiar, T., B. A., B. L.	10
15. „ Rangachariar, K. Rai Bahadur	7
16. „ Ananda Rao, D., B. Sc.	5
17. „ Chelvaranga Raju, J.,	5
18. „ Deviah, K. C.	5
19. „ Lakshmivarah Ayyangar, B. A., B. L.	5
20. „ Muhammad Miran Sahib, P. N. B. A.	5
21. „ Ramasastrulu Naidu, K., B. Sc.	5
22. „ Ramaswami Sivan, M. R., B. A., D. A.	5
23. „ D'Silva, S. L.	3
24. „ Jogi Raju, G., D. A.	3
25. „ Rajagopalachari, T. V., D. A.	3
26. „ Sundaresa Ayyar, K. P., L. Ag.	3

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27. Mr. Tadulioga Mudaliar, T., F. L. S.	2
28. „ Govindi Kidavu, M., D. A.	2
29. „ Javarayya, G. L. Ag.	2
30. „ Rama Rao, A., Rao Sahib, D. A.	2
31. „ Ramaswami Ayyar, R., D. A.	2
32. „ Sreenivasachariu, T. V.,	2
33. „ Tillo, K. B., D. A.	2
34. „ Veeraraghava Rao, M., L. Ag.	2
35. „ Venkaswami Rao, T. R., D. A.	2
36. „ Vittal Rao, U., L. Ag.	1½
37. „ Krishnamurti Rao, K., D. A.	1½

Towards the permanent fund.

Mr. Rao Bahadur Krishnaswami Ayyengar, N., B.A., B.L.,	15
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Notices.

In response to the notification in the November issue of the Journal for advance subscriptions for the coming year, we are glad to mention, that some of the subscribers were kind enough to send in their subscriptions of Rs. 2; for others the January issue will be sent by V. P. P., if we are not favoured with a remittance before the end of January, and we request such gentlemen to take delivery of the same.

The Students' Club is entirely self supporting, and depends for its funds on the subscriptions of the students themselves, and playing members, and the donations of well wishers. Donations will be thankfully received by the Secretary and will be acknowledged in the pages of this Journal.

Proposals are on foot to start a Students' Library and the matter is being investigated by a committee of students. It is hoped to get the assistance of the Govt. in the erection of a Combined Reading Room and Library. We shall make our needs known to our many friends and well wishers when the scheme is floated.

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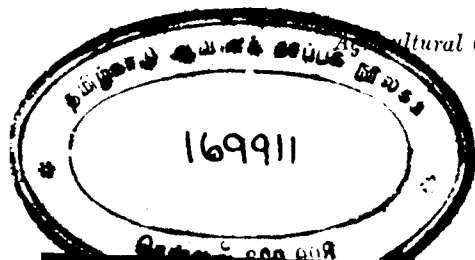
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