

THE JOURNAL
OF
**The Madras Agricultural Students'
Union.**

Vol. III.

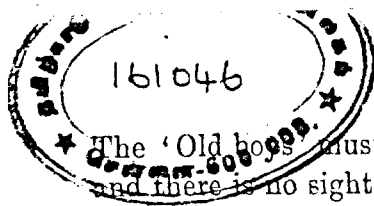
January 1915.

No. I.

1914.—A Retrospect.

While we enter a new year full of promise and hope, it may be worth our while to take stock of the year that is just past and over. The year was ushered in with fairly good harvests in spite of the trying season of the previous year in many parts of the Presidency. The summer was very severe, which was followed in the north by an early outburst of the monsoon. This ended in floods in some districts, especially in Krishna where great damage was done to property and crops alike. On the other hand, the south was unusually dry through the first half year and early sowings had either to be resown or given up altogether. The north-east monsoon has, however, been fair and it is likely that decent harvests will yet be taken.

The year under review has not been uneventful for ~~the~~ Department. The College Day was a great success.



The 'Old boys' mustered strong round their *alma mater* and there is no sight more pleasing than when old friends meet on an occasion like this to compare notes and renew their friendship. It was very gratifying that so many members and friends of the Union responded to the invitation and took part in the deliberations of the Conference. The College term began with double the number of "freshers" owing to the new course started. The Students' Quarterly Journal has been metamorphosed into a Monthly. The Director's Office has been strengthened by the appointment of a Personal Assistant to the Director. The activities of the Department in the districts have been extended by the opening of a second Agricultural Farm in the Kurnool District. Proposals for the reorganisation of the Madras Agricultural Department have been placed before the Secretary of State and it is hoped much good will come out of them. These events are no doubt full of augury for the future.

But it should not be forgotten that the year has had its dark side. We refer to the great European War. The rally that India has made at this time of trial has created a deep impression in the minds of the British people and, from what one hears and reads, the attitude of the British public towards India and her people has already undergone a transformation. Our brave soldiers are fighting the Empire's battles and are winning an undying fame. Those of us who remain here have our share in relieving the distressed which should be done and is being done wholeheartedly. It becomes the duty of the members of the Union who have opportunities of coming in contact

with the village folks to keep them informed of the real nature of things, without untruth or exaggeration, especially at a time like this when one is likely to be dejected at every little reverse or accident.

We have to fight against prejudice and fault-finding and work for better understanding and mutual esteem. The past is irreparable and irrevocable but let us make sure that, in the future, we shall not permit the doors of opportunity to shut in our faces.

The Agriculture Trade Conference and His Excellency the Governor of Madras.

The Indian Industrial Conference held on 26th December at Madras is more or less a non-official concern, although, amongst the 28 papers submitted to the Conference, a good number has been contributed by Government Officials, the Director of Industries, Madras, for instance. The Agriculture-Trade Conference, however, was engineered by the Departmental Heads of Government and aimed at bringing about a closer relationship between the grower, as represented by the Agricultural Department, for instance, and the tradesmen represented by the various Firms who are the means of distributing the produce, finished or unfinished, of the grower, to the consumers who may be in the country or outside it. His Excellency the Governor who presided in explaining the object of the Conference said:—"During the last eight years, substantial grants and much attention have been given by Government to the development of Agriculture and the improvement of agricultural practice; and although the Department has by no means yet reached its full strength and scope, considerable success has resulted from its efforts. As far as this can be ascribed to any one cause, it is due to the policy of sending

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trained men into the districts to get into direct touch with cultivators, to study their conditions and work their indigenous crops. It is claimed, with good reason, that under normal conditions the improvements already introduced and adopted by the ryots in the districts are worth to them more than a crore of rupees a year and this although hitherto work of this description has only been possible in some portions of the Presidency. And the other hand, the growing of crops and the methods of cultivation are only a portion of the economic development of a country. It is through you and the firms which you represent that our commercial crops are brought upon the world's market.

None knows so well as you the clash of interests between different branches of trade and commerce, yet few are in a better position to realise the benefits which flow from an established market for a recognised commodity, the need for products to be up to the sample, the advantages and difficulties of trading in bulk, and the openings and best markets for different products. Hence, to advance the economic condition of our country, to develop its markets, in a word, to increase its general productivity require the co-operation of both the growers and the purchasers. Both the producers and the purchasers are interested. Now better farming is better business; and the first and immediate test to be applied to all departments directly designed to work for the agricultural development of a country is not philanthropic but material—namely, are they promoting better farming and better business?

Thus, if the Agricultural and Industrial Departments are to be of full service to the ryots, it is essential that they shall be in close touch with the trading interest. While they do not claim or pretend to be in any sense a complete intermediary between the ryot and the purchaser, they are already in direct touch with many of the ryots in many places. They most readily acknowledge the help they have received from many of

you gentlemen who are here to-day, both in advice and active assistance in the districts. And now that there are grounds for believing that they are steadily gaining more and more influence with the ryots, this meeting has been summoned with the object of bringing them into closer touch with commercial interests, in the hope that by your advice and criticism, their work and energies may be directed towards objects immediately profitable and useful; and that, as a result of the discussions which I hope will take place, mutual knowledge of objects and difficulties of conditions and limitations may be increased. They do not ask for your general commendation or tolerant sympathy; they would, I am certain, prefer criticism and discussion; and, to encourage this it is proposed that separate Meetings shall be held (according to the time-table which has been given to you) of those chiefly interested in the different staples of the Presidency."

Speaking of the Agricultural Department in its past and present policy, His Excellency said:—It is right to look upon the Agricultural Department as one of the youngest of the departments of Government, though as a matter of fact, it has existed in one form or another for sixty years. In that time it has had a very chequered career, periods of high hope have alternated with long periods of depression and almost despondency. The department as now being organised differs, however, in two very vital points from its predecessor. In 1854, when the attention of Government was seriously turned to agricultural improvement, the all-pervading idea was the introduction of foreign implements, foreign stock, foreign seed and the demonstration of their advantages, on a "Model" farm. Thus, sixty years ago, orders were placed in England for a steam plough, threshing machines, winnowers, several iron ploughs and harrows, in fact, for a full set of all the aids to the capitalistic large farming of the West. After a short period of management by a Committee of amateurs, a trained Superintendent was brought out from England to manage these

strange implements on the "Model" farm at Saidapet. The Superintendent was in Madras for almost ten years before he toured at all and before he ever saw an up-country village. It was the same with their cattle and with their seed. The foundation of their herd was laid by some cows described as Aden cattle, -- because they were brought here in a ship which came from that place. So with seeds, exotics were obtained and sent to ryots or Collectors up-country, with meagre instructions. All these efforts, however, did not end in failure. Where local demonstration was possible and was systematically followed, some changes were established, *e. g.*, the introduction of Bourbon cotton into Coimbatore in 1820, the introduction of large iron ploughs into Bellary by Mr. Sabbapati Mudaliar in the seventies, the introduction of the iron sugarcane crushing mill and the introduction of barley into the Nilgiris.

On the other hand, the policy which has been steadily developed during the last eight years has been to send trained men into the districts, and as such trained men become available, to open local agricultural stations, where exotics can be thoroughly tested whenever necessary, but who shall primarily and mainly, by detailed and continuous work, endeavour to improve the quality, the yield and the methods of cultivation of the indigenous staple crops of the Presidency. The facts there learnt and tested are then communicated and demonstrated to the villagers on their own land, by trained and competent agents. More on this I need not say; except that the success already achieved promises well for the future and that there is undoubtedly a growing interest and spirit abroad in the districts towards agricultural and industrial improvement. The vital differences then between the old and the younger departments are that attention is now in the first place paid to indigenous crops under the local conditions in which the ryot works, and secondly in the organisation of a trained up-country staff. Thus it is that I said that I hoped that this, the first meeting,

for discussion with the commercial houses, will mark a further step in an organised scheme of development, by bringing the Industrial as well as the Agricultural Department into still closer touch with the local conditions of that which directly affects all their efforts, namely, their market. I refer, of course, to the purchasers of their produce, as represented here to-day by the leading export and commercial firms of the Presidency."

In concluding his address, His Excellency hoped that, from the help, advice, and criticism offered by the members during the discussions, "these young departments, Co-operation, Industries and Agriculture, which, with the Forest and Fisheries Departments, were more particularly charged with the duty of conserving and developing the wealth and national resources of the country, might derive strength and knowledge for further progress."

We hope to give a report of the deliberations of the various committees in a future issue.

The Indian Industrial Conference.

The address of the Hon'ble Mr. Manmohandas Ramji, President of the Indian Industrial Conference, is well thought out, based on actual experience of agriculture, industry and commerce. After reviewing the hardships caused by the war and the possibilities of capturing the trade of Germany and Austria, he states that "a large portion, if not the whole, of the trade, can be captured if our people acquire the necessary scientific training, experience and, above all, a thoroughness of working. I appeal to our young men to devote themselves more and more to science, trade and industries and to take up their work in no light-hearted spirit, but to apply themselves heart and soul to their respective line of work, giving their best to it and thus help forward the cause of commercial and industrial progress. It is only thus that

some of the greatest industries of the West are built up and not by waiting for Government help and struggling for petty clerical services." While he recognises that Government should not interfere with private trade in the country, he asks for financial assistance in forwarding new industries, at least, by the appointment of special experts to study and report upon, particular industries and the opening of technological institutes—Schemes in which the Government has already taken action. He pleads also earnestly for intensive industrialism and intensive agriculture to go hand in hand, as this alone has tended to enormous developments of wealth in the west.

Cultivation of Rice in Spain.

Dr. E. J. Butler, Imperial Mycologist who was the official delegate for India at the International Rice Congress held at Valencia, contributes an excellent article to the Agricultural Journal of India on the Cultivation of Rice in Spain. 96,000 acres of land, chiefly in Valencia district on the east coast of Spain, are annually grown with rice. There is much resemblance between the cultivation in India and in Spain. First the land in which rice is grown is permanent rice land, unlike Italy or Greece where rice is grown in rotation with other crops. Secondly the area is supplied with a good system of irrigation canals. Transplanting is the universal practice. Higher land with easy drainage is chosen for raising seedlings and these are planted in well puddled lands in clumps of 3 to 5 plants. The rate of seed bed to field area is 1 to 10 or 12. Water is run off from the field a month after planting, and the weeding is thoroughly done. Harvesting is done with sickles, the crop is threshed by the treading of animals and the corn is winnowed with the help of the wind. The methods which may be termed distinctly oriental were introduced into the country by the Moors who had

conquered and settled in Spain in the 14th and 15th centuries. It is apparently due to the zenana system of the Moors that the transplanting is done by men, 6 of whom could plant $2\frac{1}{2}$ acres in a day.

The differences, however, in the system of cultivation, as practiced in Spain and India, are more important to be stated here. These are (1) a universally accepted practice of a thorough deep cold weather cultivation, rendered possible by the use of specially adapted implements, (2) the application, on the average of 600 to 800 lbs of a concentrated fertiliser (40% sulphate of ammonia, 54% superphosphate and 6% sulphate of potash),— the necessity for potash manure is still a debated point there— and (3) the introduction of exotic varieties to check deterioration of races long cultivated in the same environment.

The produce for 96,000 acres amounts to 246,000 tons which works out to 5,700 lbs per acre on the average!

The subjects for discussion were referred under 8 heads to 8 Committees and the notes and discussions of the Committees along with their conclusions couched in the form of Resolutions, were placed for formal acceptance at the Session of the Congress. Excursions had been arranged to the chief centres of cultivation and there were opportunities for the delegates informally learning from one another. The subjects taken up were:—

- (1) The study of varieties of rice, their importation and preservation of their characters by selection.
- (2) The assimilation of fertilising ingredients by rice and the most modern methods of manuring the crop.
- (3) The operations of cultivation, harvest, and elaboration and the machines most suitable, esp. in small holdings.
- (4) The influence of improvements in rice cultivation on the live stock (horses in Spain).

- (5) The diseases of rice.
- (6) The world's commerce in rice.
- (7) Co-operative Societies of Production and Consumption as applied to rice.
- (8) The effect of increase of rice cultivation on public health.

Important conclusions were arrived at with respect to each of the 8 subheads mentioned, most of which have a direct application to Indian conditions and we are sorry that, for want of space, we are unable to give a larger abstract in our Journal and have to refer our readers to the original article for a detailed information.

Practice Better Than Precept.

Mr. C. K. Ramaswamy Goundar, landlord, Kallapatti writes:—

I sowed thin seed bed of Samba paddy on the 25th August 1913 at the rate of 7 Madras Measures of paddy in 7 cents for transplanting an acre.

Doubts were expressed at first, when transplanting was done after 42 days, whether the crop would come up well.

The crop suffered at the outset for want of water but subsequently regained its vigour when freshes were received in the channel. About a month and half after transplanting, the crops had an attack of worms, specimens of which were sent to the Government Entomologist for identification and advice. He advised me to drain the water off the fields which is also our local practice. The crop recovered from the disease later and tillered freely.

At the harvest time from the 3½ acres of single seedling plots, I obtained 48 salagais of paddy which come to about 14 salagais per acre, the ordinary yield being about 10 salagais.

I am perfectly satisfied with this method and, for the Kar crop of this season, I have raised single seedlings sufficient to transplant 30 acres, and in future all my fields will be transplanted singly and my neighbours who have watched these results carefully, intend doing this for the next Samba crop.

Mr. K. P. Karuthiruma Goundan, Village Munsiff, Nanjaipuliyampatti, Gobichettipalayam Taluk, writes:—

In leaflet No. 9 of 1913, full details as regards the profit obtained by me by adopting single seedling method last year are given. This year in S. No. 193 a quantity of 28 Madras Measures of Samba paddy seed was sown on an area of 28 cents. In S. No. 173 A, 7 Madras Measures of Anaikomban seed were sown in 7 cents. Seedlings from 18 cents were found sufficient for transplanting 4 acres in the case of samba, while 5 cents Anaikomban nursery was sufficient for transplanting an acre. The paddy crops ordinarily transplanted had an attack of "Sembam" disease occurred to the single seedling crops. The single seedling crop was stout, darker in colour and tillered freely to the extent of 16 to 22, and also put forth longer earheads which had grains closely set. Like the ordinary fields, the single seedling plots also received cattle manure. At my instance and after seeing my single seedling crop of last year, K. Karuthiruma Goundan and M. C. Rungiah Goundan raised single seedlings in 1 acre and 36 cents respectively and obtained profit as noted below. Owing to the scarcity of water, there is slightly reduced yield. Several ryots in Nanjaipuliyampatti and in adjoining villages, after seeing my single seedling crop and on my inducement, are desirous of growing single seedling crop during next year. I also intend raising single seedlings on 10 acres during the coming season.

PARTICULARS OF YIELD.

No.	Names of ryots who raised single seedlings.	S. No.	Area of single seedlings planted.	Yield of ordinary crops this year.	Yield of single seedling crops.
* { 1	K. P. Karuthiruma Goundan.	192A	Ac. Cets. 4 00	Salagais. 11½	Salagais. 14½
	Do	193			
		173A	1 00	17	17
2	M. C. Rungiah Goundan	389A	- 36	13	13
3	K. Karuthiruma Goundan.	75	1 00	7½	10½

* NOTE:—Savings of surplus seed in transplanting 5 acres.

VALLAMS. VALLAMS.

... 70 — 11½ = 58½

SALAGAIS. SALAGAIS.

Increased yield for 5 acres. 75 — 61 = 14

The crop was sold at Rs. 9/- per Salagai.

Savings in seed per acre about 11½ Vallams.

Increased yield per acre about 2½ Salagais.

The Munagala Prize Eassay 1914.

Paddy Cultivation in the Madras Presidency and the Lines of improving it, with Special Reference to the Pithapuram Estate.

Paddy ranks first among the crops cultivated in this Presidency and affords its people a most esteemed food grain. Being easy to grow and a much surer and more profitable crop than most others, ryots take to it with a fondness and are always anxious to bring as much of their land as possible under its cultivation.

The crop occupies about 10 out of the 36 million acres of the annual cultivated area of this Presidency. Its cultivation is most

extensive in the highly irrigated deltaic tracts of the East Coast and the districts of Malabar and South Canara where the rainfall is so abundant as to render artificial irrigation almost unnecessary. In other parts of the Presidency too, there are considerable areas under it, depending as they do, on more or less precarious sources of irrigation.

Varieties.

The paddy plant varies greatly in habit of growth as well as in the size, form, colour, weight and composition of the grain, thus giving rise to numberless varieties, which, for practical purposes, may be classified in a number of ways.

Primarily, the different varieties of paddy may be grouped into two main classes viz., the dry and the wet, though intermediate forms also occur. Paddies of the former class are usually grown without irrigation and need no more moisture than the ordinary cereals. These are met with in the dry lands of various districts in the Presidency and on the hill slopes of the West Coast. Those of the latter class, also termed 'swamp paddies' are semi-aquatic in nature, and require for their successful cultivation plenty of rain or copious irrigation. The majority of the cultivated varieties of paddy belong to this class and are usually first sown in a seed bed and then transplanted into the field.

The classification of varieties into early and late kinds, based on the time taken by them to mature is also a common one. Those which take about 4½ months or less are generally considered to be early or 'punasa' and those which take a longer time, late or 'pedda.'

The slenderness or robustness of growth, the drought or flood resisting capacity and the tillering power of the plant as well as the size of the ear and the closeness of the grain in it are other characteristics in which the several varieties differ and from which their suitability for cultivation is usually judged.

According to variations in the size and shape of the grain, paddies can be classed as coarse, medium and fine or as long, medium and

short. These and other various characteristics of the grain, such as the absence of awns, the weight and boldness of the grain and the colour, composition, and percentage of the rice yielded, determine the merits of the different varieties.

Soil.

Loams and clay loams, free from weeds, are generally the soils most suitable for dry paddies though lighter soils are also sometimes cultivated with them in several localities. The alluvial clay loams around Nidadavol in the Kistna District have been known to give very high yields.

Wet paddies have also been found to thrive best on alluvial clay loams but where there are good facilities for irrigation, fairly heavy crops are being obtained from almost all kinds of soil.

Seasons.

Dry paddies are generally sown at the beginning of the S. W. monsoon but the time at which the cultivation of wet paddies begins varies to some extent in the different parts of the Presidency.

In the Northern Circars the first crop (Saruva) which, in most places is the only one in the year, is usually sown in June or July and transplanted in July and August, both early and late varieties being cultivated. The 2nd crop (Dalwa), possible only in the deltaic tracts, is sown at the end of December or beginning of January and planted out a month later, only early varieties being cultivated at this season.

In the Tanjore district the first crop is sown in the nurseries in June and harvested in August or September if early varieties (here termed 'Kar') are cultivated, the late (Samba or Pishanum) varieties being usually sown in July and August and harvested in January. On double-cropped lands the second crop usually succeeds an early first crop in October or November and is harvested in January or February. A third crop is sometimes grown after this.

In most other districts in the South the times at which the different wet paddy crops are cultivated more or less correspond to the above.

On the West Coast wet paddy lands are of three classes high, middling and low, the first generally carrying two, and the others only one crop in the year.

In the cultivation of paddy the season at which it is sown and planted out is of great importance. In the Northern Circars especially, any delay in sowing or transplanting is attended with very serious reduction in the yield, the growth of the crop being poor and often checked by insect pests. Varieties usually grown at one season do not generally suit another season but there are a few exceptions. Garika Sannavari, for instance, suits both the *Saruva* and *Dalwa* crops in the Godavari delta.

Rotations and Mixtures.

Wet paddies are generally grown year after year on the same land, but in some parts of the Coimbatore and other districts, where the land is well drained, it is sometimes rotated with garden crops, such as turmeric, betel-vine, sugarcane and plantains. Within the same year the paddy crop is usually succeeded by pulse or where irrigation facilities exist, by gingelly, ragi or a 2nd crop of paddy.

Dry paddies, though generally sown alone on the hill-slopes of the West Coast and sometimes in other districts also, are most commonly grown as a mixed crop with red gram and cotton or red gram alone. This mixture is usually cultivated year after year on the same land but occasionally a change to chillies or cholam is effected.

When grown alone, as in some parts of the Kistna District, dry paddy is followed by Bengal gram or blackgram as dry crops, or by garlic or gingelly under irrigation. A noteworthy rotation in which the dry paddy crop is successively followed in the same year (under irrigation) by garlic, gingelly, and greengram (teegapasara), the last as a green manure crop, is sometimes practised in the Tanuku Taluk of the above district.

Cultivation :—Dry Paddies.

For dry paddies the land is usually prepared as for other dry crops and with the bursting of the monsoon, the * seed is sown broadcast, lightly ploughed and brushharrowed. One handhoeing is given about a month after sowing and another hoeing 3 or 4 weeks afterwards. The paddy is harvested in September or beginning of October; the red gram is cut in January; and the pickings of cotton last from February to May. An average yield may be said to be 1000 lbs of paddy, 600 to 800 lbs of red gram and 100 to 150 lbs of cotton in seed. Very high yields are sometimes obtained, a mixture of Budama paddy (a hardy dry variety) and redgram at the † Samalkota farm having yielded in 1908-09 produce valued at Rs. 153.

On the hill slopes of the West Coast dry paddy is grown once in several years, the jungle being cut down and burnt in the hot weather, and the seed sown broadcast after digging or ploughing at the commencement of the S.W. monsoon and harvested in August or September.

Wet Paddies.

Wet paddies, as already noted, are generally sown in a nursery and the seedlings thus reared are transplanted into the fields. In some tracts (Nellore, Trichinopoly etc.,) the seed is sown direct into puddled fields. In some places again (Nellore) it is drilled in the dry fields and the crop is grown at first as a dry one, irrigation commencing sometime afterwards.

Seedbeds.

For the transplanted paddy the cultivation operations commence with the preparation of the seedbeds. For these the best plots of the ryots' holding are usually selected. There are two systems of growing seedlings in nurseries viz., the dry and the wet. In the former they are generally grown without irrigation until the time of pulling them up except when, owing to drought, the seedlings threaten to wither

* usually 4 kunchams (23lb) of paddy, 1 seer (24lb) of redgram and 1 viss of cotton seed.

† Scientific report 1908-09 page 14.

away. In the wet system the seed (often previously sprouted) is sown in well manured and carefully puddled seed beds, and the seedlings grown under irrigation.

In both the dry and the wet systems of raising seedlings, 80 to 100 K-mes (560 to 700 lbs) of seed are generally sown in an acre of seedbed in the Pithapuram estate as well as in several other tracts, this area transplanting about 10 acres under the dry system and 15 to 20 acres under the wet system. In many parts of the southern districts the seed is often sown thicker in the nurseries and, even under this system, the seed rate often comes to about 100 lbs or more per acre transplanted. In some parts of the Kistna district, however, the ryots are able to manage with only 20 to 30 lbs.

Puddling.

While the seedlings grow in the nurseries, the preparation of the land to be transplanted is briskly attended to. Any manure that might have been carted previously is first spread over. Water is then let in and the land puddled. Usually this operation is repeated 2 or 3 times at intervals of a week but, when water cannot be got at will, it is finished at one stretch and the land transplanted. Sometimes the fields are ploughed dry before puddling. In some places where the soil cracks deeply and swells on water being let in, no puddling is at all done, the plots being merely trodden over by cattle and planted.

Manuring.

Systematic manuring of paddy lands is rare in many parts of the Presidency, though, owing to the gradual impoverishment of the soil, its necessity has of late been keenly felt, especially in the continuously cropped deltaic tracts. Farm yard manure and village rubbish are the only manures generally available to the ryot for his paddy crop. Sheep and cattle are also often penned on paddy lands. In the Kistna and Godaveri deltas, patimannu is largely used as manure for paddy. Silt is also sometimes carted. Oil cakes (castor and margosa) are occasionally applied. In the Coimbatore, Tinnevely and a few other districts, wild indigo leaves are largely gathered from roadsides and

waste lands and used as green manure. In some parts this crop is especially grown for the purpose on paddy fields after the harvest of the 1st crop. Sunhemp is sometimes similarly grown in the Godavari and Kistna deltas for the same purpose.

Transplanting.

By the time the fields are thus prepared the seedlings also get ready for being planted out. Early varieties are generally kept in the seedbeds for 3 to 5 weeks and the late ones 2 or 3 weeks longer. As soon as the plots to be transplanted are ready, water is let into the nursery and the seedlings carefully pulled out and tied into bundles. These are then carried and distributed over the puddled field where the seedlings are separated and transplanted by women. To carry the seedlings from the nursery for distribution over the puddled fields, an implement called *Chalugudu*, literally a sledge, is often employed in the neighbourhood of Pithapuram and is a very convenient means for the purpose.

The number of seedlings planted in each place and the distance apart at which they are put in, varies greatly in different parts of the Presidency. The general rule in most places is to plant 2 to 6 seedlings about 6 inches apart. In some parts of the southern districts bunches of 10 to 20 or more seedlings are planted about 9" to 1 foot apart, an enormous wastage of seedlings occurring thereby. In some taluqs of Godavari and Kistna deltas, however, the practices of planting seedlings, one by one, obtains.

Broadcast Sowing.

The system of sowing the seed direct in puddled lands is occasionally resorted to in some parts of the southern districts as well as in the Nellore and Coimbatore Districts. This course is usually adopted only in the case of early varieties.

Drilling and Dibbling.

The practice of drilling the seeds and treating the crop as a dry one during the early stages of its growth is largely prevalent in the Nellore District where the tanks do not fill early, owing to the S. W. monsoon

rains being insufficient. On the West Coast also the system of broadcast sowing or dibbling the seed in plough-furrows and treating the crop a dry one for some time is occasionally adopted in the case of the 1st crop.

Double Transplantation.

In the Madura district the young plants raised in the nursery are sometimes transplanted to a second nursery and afterwards replanted into the fields.

Irrigation.

From the time of transplantation up to two or three weeks before harvest, the paddy fields are generally kept under 2 to 6 inches of water. Frequent renewal of water is considered desirable to prevent stagnation as well as to facilitate the deposition of as large a quantity of silt as possible.

Weeding.

In transplanted paddy a weeding 5 or 6 weeks after planting is found enough, but in foul fields another weeding some weeks after the first may also be necessary. In fields where the seed is drilled, the *Pandla Mann* or metlaguntaka is passed over occasionally until water is let in and one weeding is given sometime after.

Topping.

In certain parts where paddy grows too luxuriantly to be able to stand erect till it comes into ear, the tops are cut away with a sickle and used as fodder. Sometimes cattle are allowed to graze over the fields. In rare cases a second cutting may also become necessary.

Insect pests and diseases.

Insect pests and diseases of paddy, though numerous enough, rarely damage the crop seriously, except when planted late. The principal insect pests to which the paddy plant is liable are several leaf eating caterpillars, the grasshopper, the rice-bugs and the borer.* In the Godavari and Kistna districts considerable damage is sometimes

* Bulletin No. 67 Madras Department of Agriculture.

caused to the paddy crop (especially when transplanted late or when water logging occurs) by the caterpillar of a moth scientifically known as *Cnaphalocrocis medinalis*, the pest being locally known as 'Elivi'.

The borer called 'Usathiru' (*Schoenobius bipunctifer*) is also very common in the Northern Circars, the crop infested with it throwing out a very large percentage of white chaffy ears.

The diseases of the paddy plant do not yet seem to have been well studied. In the deltaic tracts of the Godavari and Kistna districts, a disease, throwing out instead of an ear, a peculiar shoot resembling the onion flower-stalk, is prevalent on poor lands. Other diseases are 'errathegulu' in which the ends of the leaves become reddish and gradually wither up, and 'dumpu' in which the crop becomes depressed in patches and produces, if at all, crumpled ears which do not fully come out of their leaf sheaths.

Insect pests and diseases are, as a rule, more common in the deltaic tracts than in the non-deltaic areas.

Harvest.

As soon as the crop turns yellow and all the grain in the ears gets ripe, the crop is cut by the sickle. In the Southern districts the crop is generally thrashed immediately after harvest by beating on planks. But in the Telugu districts the sheaves are usually allowed to dry in the field and then stacked, the thrashing being done at leisure by being trodden by bullocks. Even in the case of hand thrashing the straw is again trodden by cattle to make it soft and remove any grain that might remain away after the first operation. In the operation of thrashing, the bullocks are either let loose or tied in rows of four or five.

Thrashing being over, the grain mixed with chaff and broken pieces of straw, is winnowed with the aid of the wind, dried and stored in godowns, puris (straw-bins) or underground pits. Seed grain is usually stored in straw bundles, basketbins or sacks.

The average yield of the transplanted crop on fairly rich lands may be taken as 2100 lbs of grain and $1\frac{1}{2}$ tons of straw per acre. More than 4000 lbs of grain and 2 tons of straw are obtained in several places. In the Samalkota Farm in 1912-13 the yield in a certain plot of Rasangi was 4960 lbs of grain and 5200 lbs of straw, thus showing what the paddy plant is capable of.

The cost of cultivation varies greatly in different places but in the vicinity of Pithapuram it may be estimated at about Rs. 24 per acre excluding the estate rent which will be about Rs. 12. The value of the gross yield 2,100 lbs of grain and $1\frac{1}{2}$ tons of straw will ordinarily come to Rs. 60 for the grain and Rs. 12 for the straw, the profit for the cultivator thus being about Rs. 36 per acre. When a high yield is obtained by careful cultivation, the net profit may come up to more than Rs. 150 per acre.*

Improvements.

The existing methods of paddy cultivation in the Madras Presidency have been thus briefly described and, in the following pages, it is proposed to suggest some lines of improvement, especially with reference to the Pithapuram Estate, which is situated in the Godavari District and consists of both deltaic and non-deltaic paddy tracts.

Thin sowing and single planting.

The first and the most unquestionable improvement that can be suggested to the royts over the greater part of the Presidency is the adoption of an economic seedrate by sowing thinly in the seedbeds and planting out the seedlings one by one instead of in bunches. On some of the Government Farms as well as the Pithapuram Estate farm, it has been proved that, if the seed is sown in well prepared seedbeds at about 40 k or 280 lbs only per acre (instead of 560 to 700 lbs or more), the seedlings will be robust and can be easily singled out and planted one by one, seedlings from an acre of seedbed thus sufficing for 10 to 13 acres of the area to

* Scientific Report of the Coimbatore Farm 1912-1913 page 12.

be transplanted. The seed rate, therefore, works up to only 3 to 4 k (21 to 28 lbs) per acre. With some extra care, it can be reduced to even 2k or 14 lbs per acre. In most parts of the presidency including the Pithapuram Estate as already noted, a much higher rate prevails and the adoption of the economic method will enable the ryot to save much of the seed he usually wastes.

In the Southern Districts where the existing method is very defective compared with that of the Telugu Districts, the introduction of this improvement by the Agricultural Department has been very successful, several of the ryots testifying to the three advantages of it, viz :-- saving of seed, saving of labour and increase in yield.

The distance apart at which seedlings have to be planted is a matter to be determined by each ryot for himself, according to the condition of the soil and time of planting. In poor soils and in the latter part of the transplanting season, planting has to be done closer than in good soils, planted early in the season. On the Pithapuram Estate Farm in an average season, 6" has been found the most suitable distance when the seedlings are planted singly, 9" being too far. In the deltaic tracts under fair treatment, singles 9" apart may be more profitable.

The problem of manuring the land is also of great importance in paddy cultivation. In many villages in the large paddy growing tracts of the presidency, the supply of farm yard manure, village rubbish and other manures usually available is so limited that, even in case they are solely used for paddy lands, they may not be sufficient even for a tenth of the whole area every year. Other means of meeting the difficulty have therefore to be devised.

Green Manuring

The practice of green manuring already in vogue in some parts of the Presidency will, if more widely and systematically adopted, solve the question of supplying Nitrogen, the most needed ingredient to the

soil. On the Government Farms as well as on the Pithapuram and Sivagiri Estate Farms, it has been shown that, by this means, the yield of the crop can be considerably increased at a moderate cost (Leaflet No. 18 of 1911 Madras Agricultural Department). For this purpose leaves of wild plants, such as vempali, wild indigo, jilledu, madar and others, may be gathered and used, or crops like sunhemp or daincha may be grown on the land itself.

On the Samalkota Farm daincha, teegapesara and sunhemp have been very successfully grown as ante-monsoon green manure crops, thriving best when sown in April-May under irrigation and this method may be followed by the ryots of the deltaic tracts of the Pithapuram Estate.

In the non-deltaic tracts sunhemp may be sown at the time of the harvest of paddy, especially the early varieties, but the crop cannot be ploughed in when in flower, there being no moisture in the soil at that time. It has therefore to be cut and preserved till the next rainy season. In seasons in which the S. W. monsoon bursts early, sunhemp can also be sometimes grown previous to the paddy crop, the seed being sown immediately after the first showers, at the same time as paddy seed beds. Under favourable circumstances, the crop will grow 3 or 4 feet high in four or five weeks and may be ploughed in as green manure by the time seedlings of the late varieties get ready.*

In the Southern districts daincha, sunhemp, and wild indigo, have all been successful as green manure crops, the last being specially hard and immune from insect pests.

The question of green manuring is sometimes complicated by other conditions. At the recently opened Manganallur Farm, the effect of green manuring was quite disappointing and this was attributed to the land being ill drained. Researches by the Madras Agricultural Chemist have also led him to the conclusion that drainage or at least some movement of soil water is essential for paddy cultivation, especially when bulky organic manures are applied.†

* Leaflet No. 1 of 1913 Madras Agricultural Department.

* Journal of the Madras Agricultural Students' Union Vol. I. P. 248.

† Report on the Operations of the Department of Agriculture, Madras 1912-13, p. 5.

The ploughing and irrigation of the land in summer to grow ante-monsoon green manure crops has been found to sometimes produce a baneful effect on the soil. What the exact changes are which are thereby effected is not clearly known, but the Principal of the Agricultural College, Coimbatore is of opinion that "it is partly biological and partly due to the alteration in the texture of the soil, which follows a summer ploughing and subsequent drying, this alteration leading to the blocking of the pore spaces and consequent loss of percolation."* It has also been the common experience on the Pithapuram Estate farm and the vicinity, that fields into which water is let in for puddling in one irrigation turn of the Yeleru Channel but which could not be puddled and planted till the next turn on account of the insufficiency of water, the crop is generally poor. All soils, however, do not seem to be affected in this way.

Use of superphosphates or bone meal.

To supply the deficiency of Phosphoric acid in the soil, the application of superphosphate or bonemeal has been found to be effective in several places. In combination with green manure this has given very good results at Samalkota and Coimbatore Farms.† In the Kistna Delta, where the supply of patimannu is being exhausted, green manure and superphosphate or bonemeal have been found to be a suitable substitute for it. The ryots of the deltaic villages of the Pithapuram estate may, wherever necessity occurs, advantageously use superphosphate or bonemeal, alone, or in combination with green manure.

In the neighbourhood of Pithapuram as well as in other non-deltaic tracts, the use of patimannu is yet rare and, except where it is not available, the use of superphosphate or bonemeal does not seem warranted. In this tract the use of this earth in combination with farm yard manure or green manure is recommended.‡

* Scientific Report of the Coimbatore Farm 1912-13 P. 16.

† Report on the Operations of the Department of Agriculture, Madras 1912-13 P. 4.

‡ Indian Agriculturist Vol. 37 P. 303.

The use of potash manures has not been generally found to be of much use for paddy except in a few places in the Kistna District, owing perhaps to a larger quantity of this ingredient being received through the irrigation water than the other two.*

Other manures that have proved economically successful are castor cake, especially the black one, and poudrette.† Pig manure also gives heavy crops, and is being now used in the vicinity of Pithapuram to some extent.

Choice of variety.

Considerable improvement in the yield and quality of paddy may also be effected by a careful choice of variety, seed selection and production of superior strains. The choice of a suitable variety is generally well understood by the ryots, hardy, heavy yielding, though coarse, sorts being usually selected. But in many places there is yet room to introduce heavy yielding varieties of better quality. Ratnachudi paddy which has stood the test in the Pithapuram estate farm may be safely recommended to be cultivated in all, yield and quality having been both very satisfactory. A variety from Burma, going by the name of Rangoon paddy, has also been found to yield very heavily in the non-deltaic tracts of the Pithapuram estate and may be more largely cultivated. In some of the deltaic parts of the Godavari and Kistna districts, Swarnavari, a recent introduction from the south, is said to have given satisfaction as a dalwa crop and deserves to be encouraged as a substitute for the coarse black paddies usually grown.

Selection of Seed.

The importance of seed selection is little realised by ryots in general, though there is a familiar proverb in telugu '*Vithukoladi Mokka*' meaning "as is the seed so is the plant." If a little seed (say a Kuncham) is selected from the healthy well grown plants every year and a crop raised in the following year from this in a small well prepared plot, the grain from this crop will be suffi-

* Journal of the Madras Agricultural Students' Union Vol. I-p. 235.

† Agricultural Journal of India Vol. VII p. 312.

cient for a large area during the succeeding year. Thus every ryot may with a little trouble secure a constant supply of pure and sound seed. The above method has been adopted in the case of most varieties grown on the Pithapuram Estate Farm and several ryots who purchased seed or seedlings from it have expressed that the crops raised from the farm seed or seedlings yield better.

The Japanese method of selecting heavy seed by immersion in salt water (1 seer of salt to 2 seers of water) is said to have given good results in Mysore.*

Production of superior strains.

The selection of seed from individual plants which show considerable superiority over others is a more scientific, yet simple, method than the above mechanical ones. Some work on these lines is already in progress at some of the Government Farms. Here single plants, true to type, are selected and seed raised from these, rejecting strictly all which, in subsequent generations, do not maintain the superiority at first sown. At Palur a single plant selection from Garudansamba grown on a field scale yielded a much heavier crop than the usual Garudansamba.† Dr. Locke of the Royal Botanical Gardens, Peradenia, is said to have by this means effected an improvement of 50% in the yield of a transplanted crop.§

The process of selection has generally to be carried on through several generations before the type becomes fixed and even afterwards much care has to be exercised to guard against admixture with other varieties and to prevent cross-fertilisation which is said to be more common than usually understood, when plants of different varieties are grown close together.

* Agricultural Journal of India Vol. VII p. 312.

† Report on the Operations of the Department of Agriculture Madras 1912-13 P. 4.

§ Indian Agriculturist Vol 37 p. 303.

Change of seed.

Occasional change of seed also appears to be necessary to keep up the yield at a high level. In some parts of the Kistna District, for instance, Atragada which was 15 years ago a favourite variety, gradually deteriorated in yield, and had to be given up in favour of Konamani and Akkullu and these again are now giving place to another variety, Kistnakatukulu which is rapidly spreading. The reason for this appears to be, as Mr. De'Sylva in a paper read at the Ceylon Planters' Association puts it,* that "plants grown for long periods under similar conditions of soil and climate adapt themselves to their environments and go what may be termed a quiescent state." When, however, a change of conditions occurs, a new activity is manifested.

Thoroughness in tillage operations also tends a good deal towards the enhancement of the yield of the paddy crop. The use of the iron plough which proved successful on the Sivagiri Farm† may be recommended on sandy soils. The levelling board should always be used to remove inequalities after puddling. The ploughing of the land immediately after the harvest of the previous crop is sometime attended with benefit, especially in loams and sandy loams, but on clay loams and clay soils it appears to be not only of little use to the crop but is often found positively injurious.

Dr. Coleman who has studied the question in Mysore suggests the alteration in the bacterial content of the soil as the probable reason for this.

On the loams of the Pithapuram estate farm, dry ploughing has always been of benefit to the paddy crop, especially in seasons of drought. In 1911 a plot which had received good ploughing during the mango showers could admirably withstand the drought which occurred after transplanting the crop and yielded 849 lbs per acre more than the adjoining unploughed plots. The practice, therefore, can be largely adopted in all similar soils with advantage.

* Agricultural Journal of India Vol 7 page 312.

† Bulletin No. 61 Madras Agricultural Department P. 1.

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Careful Irrigation.

Paddy, though a semi-aquatic plant, requires some drainage and any care taken to prevent over-irrigation will be sure to be repaid. It is a well known fact in the Kistna and Godavari deltas that plots irrigated by Karem (a water lift for small depths) called Karem Thodupampalu' yield better than the adjoining plots irrigated by flow, thereby showing that careful and moderate irrigation is beneficial to the paddy crop.

When water has to be lifted from a small depth, the iron karem, largely used at Kadium near Rajahmundry, may be advantageously employed for the purpose elsewhere, being easily workable by one man. Besides care in actual irrigation, a great deal may also be done in the permanent improvement of the plots themselves by lowering and levelling them wherever necessary, so that they may be easily and evenly accessible to water. Much benefit accrued from such work in the Pithapuram estate farm where earth from some of the high plots had been dug out and spread over the adjoining dry and garden lands, thus improving both. For levelling plots the scraper described in pp. 53 and 54 of the Agricultural Journal of India Vol. IV has been found very useful.

Manuring weeds.

Weeding in the wet paddy crop is usually a simple operation, but the hoeing and seeding of the dry paddy crop often costs so much as to force the ryot to abandon the crop altogether. On such lands, especially when the chief weed is hariali, the method of inducing surface rooting by heavy manuring and shallow cultivation with fodder cholam, and subsequently ploughing deep with the cotton soil plough (plough successful at Koilpatti)* may be tried.

Combating Insect pests.

To minimise Uchathiri or the attack of the stem borer in the wet paddy crop, ploughing, and if possible burning of the paddy stubble after the harvest, destruction of egg masses which are conspicuous and

* Scientific report 1912-13 P. 8.

attraction of moths to traps at night are suggested. Early transplantation and careful irrigation tend a good deal to prevent this as well as 'elivi'.

In conclusion it may be said that, though ordinarily no very large increase in the yield of paddy can be effected by any single improvement or in a single year, yet by taking some extra care in each and every detail of its cultivation and for a number of years, there is no doubt that considerable enhancement can on the whole be effected.

G. JOGI RAJU

Superintendent, Tucker's Estate.

Notes.

Christmas in Madras:—Christmas week in Madras was busier this year than usual. There were people who were pouring in from the mofussil to *enjoy the season*, which means, spending the frugal savings of a year in purchasing articles of little or no value, artistically displayed in all kinds of shops from the China Bazaar upwards, in attending dramas and concerts not understood and in patronising the Park Fair and Madras coffee hotels, apart from getting crushed, both to and fro, in the Railway 3rd class carriages on concession tickets!! There were also those who came to Madras, not only from the mofussil districts of the Presidency but from other parts of India as well, to attend and take part in one or other of the Conferences and meetings held in Madras. The Indian National Congress was the centre of attraction for the non-official population, but the Indian Industrial Conference, the Indian National Social Conference, the All India Temperance Conference, the Theistic Conference, the Theosophical Convention, the Provincial Co-operative Conference, the Christian College Day, the Indian Officers' Association, not to speak of others,—each had its own votaries that the Christmas activities in Madras were at a high pitch for over a week. There were opportunities for all, young

and old alike, to show skill in organisation, read well thought out addresses, join in animated discussions or display oratorical powers. Some, from their nature, returned home as pessimistic as, and no wiser than, before; while others, apparently of an optimistic temperament, vowed to do great things in future in their own spheres of action. We would very much like to see some of them translate their vows into action, especially in the matter of the industrial improvements of the country which would also necessitate a change in the social organisation of the people. One of the planks in the platform of Social Reform activities is the Elevation of the Depressed Classes and it is on these classes that the actual labour in the field and in industrial concerns depends. The question of Agricultural Reform is largely bound up with that of raising the status of these *untouchables* and we hope that action will not end with passing a pious resolution in open Conference.

We offer our hearty congratulations, on behalf of the Union, to Mr. A. Rama Rao, Farm Manager of the Manganallur Farm on the title of Rao Saheb bestowed on him by His Excellency the Viceroy in the New Year Honours' list. Rao Saheb Rama Rao was the first Saidapet student who took a first class in Agriculture Advanced at the Govt. Technical Examinations as early as 1889. He was farming his own lands for several years and took service as Home Farm Superintendent at Sivagiri in Tinnevely about 15 years ago. He introduced vast and abiding changes in the cultivation in the neighbourhood in a quiet, unobtrusive manner, with no costly establishments or implements. The introduction of *kolingi* for green manure is due to him. His modest behaviour, cheerful manners and extremely simple life are worth copying by many an ardent agricultural reformer.

The Judges who kindly valued the Munagala Prize Essays on Paddy Cultivation last year made the following remarks:—

“In the general opinion of the examiners, the first two essays were easily the best. They had expected practically all the candidates to show a more intimate knowledge of some particular agricultural tract than has been the case. They are glad that the prize has provoked some competition but very much wish that some more of the older members of the Union who have actually been in charge of farms had competed; and, if any such prize is again offered for open competition, they earnestly hope that some of the senior officers will compete.”

In the light of the above remarks, we invite the attention of our members, including Honorary members and Associates, to the announcement, elsewhere, of two similar competitions instituted this year by Mr. K. Ramasastrulu and Mr. T. S. Venkataraman respectively.

In response to the requests of many of the competitors for the Munagala prize last year, the utmost we can do is to state the order of merit under the respective pseudonyms:—

1. Agriculturist. 2. Parasuraman (close second). 3. Ganjam and Nimbalkar. 4. Agricola Varahamihira. 5. Malayali. 6. Observer. 7. Balaraman. 8. Cultivator. 9. Virali-malai.

The United Provinces Agricultural Department has, so to say, followed the lead of Madras, in introducing, from next year, two courses of instruction at the Cawnpore Agricultural College. Instruction will be chiefly in the vernacular in the 2 years' course intended for actual cultivators and will be completely in English

in the four years' course the passed students of which will be eligible for higher appointments in the Department. Practical work in Agriculture will be, as at Coimbatore, the dominating feature in both courses. There is still a dearth of desirable candidates for admission into the college that a certain number of scholarships will be awarded to the students, a system which has apparently been found unnecessary in Madras. In fact the large number of applications for admission at the Coimbatore College, year after year, shows that we have passed the stage of luring men by offer of scholarships.

The average yield of ragi, cultivated as a dry crop, was 540 lbs. in Hebbal village and 667 lbs in the Hebbal Farm. Deep ploughing early in the season is said to double the yield at this Farm.

Selection of ragi seed by immersing in salt water has been giving an increased yield of 50% over unselected seed at the Hebbal Farm. Rather a very simple method of selection!

Mr. Hamel Smith, the talented Editor of the *Tropical Life*, London, has sent us two of his publications "The Fermentation of Cacao" and "Cocoanuts, the Consols of the East." The first book consists of the writings of 7 planters and scientific men of different parts of the world and would not be of sufficient interest to Indian readers, were it not for the fact that information is given here and there about the fermentation, oxidation and drying of coffee, tea, tobacco and indigo. The book on cocoanuts, however, is a useful book for cocoanut planters, containing detailed and lucid accounts, from the selection of sites and the starting of plantations to the different operations of manuring, cultivation and upkeep and the extraction of oil and fibre, in all parts of the world where cocoanut is grown. Very little reference is made to the cultivation of coconut in India and that little is in praise of the

excellence of the articles transhipped, both copra and oil, from Ceylon, Malabar and Cochin.

In speaking of the large number of Farmers' Organisations which are met with in all parts of United States, Dr. L. C. Coleman, Director of Agriculture in Mysore who has recently published a report on his Agricultural Tour in Europe, America and Japan in 1912-13, states that these organisations are formed by intelligent men to meet a felt want and that they are composed of men actively and intelligently engaged in Agriculture who meet for a definite purpose and when they meet can discuss intelligently and from practical experience the questions which are brought up. Agricultural Associations will be a success only when they are organised under these conditions.

In addition to the locally made tin lamps which have been used as light traps, two 500 c. p. arc lamps are being used for some months by the Govt. Entomologists' Staff and seem to be very effective. Just below the domes of the lamps, there are shallow basins of water with some kerosene.

Very interesting, though laborious, work is being carried on by the Govt. Economic Botanist & his Assistants in Paddy selection. Over 240 varieties have been carefully planted in the wet lands in 2 acres and detailed study of these varieties is being made day after day. Type plants are picked out and bagged, splitting lots from crossey are examined, numbers counted and numbers of crosses counted in material designed to show natural crossing.

The Asst. Director of Agriculture, N. Division reports that the sowing of Bengal gram in Nandyal Farm is a very slow

process. It has to be sown deep and, with 2 pairs of cattle to draw a gorru which is specially heavy and 1 pair to cover with guntaka, they just finish about 2 acres every day. Very slow indeed!

Writing about cotton selections grown in Hagari Farm, Mr. Hilson recommends their sowings in small plots with regular spacing from plant to plant in preference to, sowing them as usual, in lines, as it is then easier to tell whether the plants in a plot are of one type, and at the same time differences in type between different plots appear more striking.

Cotton, following Bengal gram, has grown more luxuriantly in Nandyal Farm than cotton following Sorghum, the former being taller, and better branched and tending to earlier flowering.

Some substances having an injurious action on certain individuals are produced when coffee berries are roasted, but may be eliminated by coating the raw berries with clay and removing the coating subsequently from the roasted berries.—B. V. N. (*From the Jl. of Soc. of Ch. Ind.*)

Transpiration in the Cactus:—Various recent observers have shown that many plants, as the cactus, with fleshy leaves or stems, which were formerly regarded as typical "xerophytes" (plants which can subsist with a small amount of moisture) prove on actual experiment to lose water quite as rapidly as "Mesophytic" plants (ordinary plants except the xerophytes and the Aquatic plants). One Petrograd Journal contributor compared the transpiration in the Cactus per hour with that in different thin leaved "Mesophytic" plants and arrived at a similar conclusion. Some of the unexpected results of this kind obtained by experiment may be explained by the very different behaviour of the stomata, in

different plants, as well as in the same plant under different conditions.—K. C. J. (*from Knowledge.*)

Effect of light on the Development of fruit:—Experiments have been made to ascertain the influence that light exercises on the development of fruit, and the results are interesting. The experiments were made by letting the fruit ripen (1) in bags that shut all rays of light; (2) in transparent bags giving an attenuated light; (3) fruit exposed to full day light. The trials were made on grapes, cherries, pears, apples, etc. From the results it would appear that light is absolutely necessary, only during the first stages of the formation of fruit and grain. After this initial stage had passed, the fruit seems able to complete its development and maturity, equally well in obscurity as well as in full light, although under the influence of the latter a great amount of dry substance was acquired. It was observed that the best results were obtained when the growing fruit was under the influence of an attenuated light, and also that the acidity of the fruit was then diminished.—J. C. R. (*From the Mark Lane Express Agricultural Journal.*)

Draining with Dynamite:—A good deal has been heard recently of the use of Dynamite and other high explosives for the removal of tree stumps and for breaking up hard subsoils in the orchard, but the latest application of the explosives is in drainage of swamps. Such swamps are often caused by the surface waters which collect on low ground failing to percolate through a comparatively thin layer of impervious clay. The water is held as in a saucer. A Kansas farmer owned a 40 acres swamp of this kind in his land and he proceeded to tap it. Across the lowest part where the water was about 3 ft. deep, he blasted a row of holes. In a few days the water had disappeared and in the following season he is said to have reaped 1600 bushels of oats from the 40 acres. Since then he has been producing four cuttings

of lucerne on this land.—J. C. R. (*From the Journal of Agriculture, Victoria.*)

Green manuring experiments with Sanai (Sunnhemp) on wheat conducted at the Cawnpore Agricultural Station give an average of 2466 lbs of grain for the unmanured plot, while the manured plot gave 1,877 lbs per acre. The summer crop was not 45 days' old when ploughed in and it is argued that the season was not favourable for green manuring on account of scanty monsoon rainfall.

On the other hand, owing to favourable rainfall, the effect of sunnhemp as a green manure on the yield of wheat grown in Atarra Experimental Station, Banda, U. P. is seen from the fact that, on the average, unmanured lands gave 1426 lbs, while the manured lands gave 2052 lbs per acre.

The application of gypsum to counteract the deleterious effects of sodium carbonate in alkaline soils was tried in two plots in the Partabgarh station, U. P. In one of the plots which contained 0.197% sodium carbonate and to which 185 maunds (1 Md=82 lbs) of gypsum were applied, the yield of barley was poor, but grass grew fairly well. In the other which contained 0.26 to 0.37% of Sodium carbonate, pits were dug from 4 to 6 feet and the dug out earth was mixed with 26 to 36 lbs of gypsum in each case and young plants of different trees *margosa*, *iluppai* (*bassia latifolia*) etc. were planted, in 1908 and 1909 and they are all doing well.

Diploma Examination Results.

The Diploma Examination in Botany was held in December, the outside examiner being Mr. R. A. Graham,

Govt. Botanist, C. P. 18 appeared and 17 passed. The following are the results:—

- | | | |
|-----|---|--------------|
| 1. | { Narasimbachari, L.
Ramanatha Aiyar, V. | } 1st class. |
| 3. | Kunhappa Nambyar, E. K. | |
| 4. | Gopalan Nayar, A. | } 2nd class. |
| 5. | Swami Rao, R. | |
| 6. | Sankaran Pillai, K. S. | |
| 7. | Srinivasan, C. R. | |
| 8. | Shinappa Tolar, B. | } 3rd class. |
| 9. | Jacob, K, M. | |
| 10. | Vridhachalam, U. | |
| 11. | { Duraiswami Aiyangar, G.
Sanjiva Rao, K. N. | |
| 13. | { Balakrishnan, M. A.
Gopalakrishnayya, A. | |
| 15. | { Adinarayana Rao, K.
Subba Rao, K. | |
| 17. | Manga Razu, K. | |

Estate.

During December, Mr. Adinarayana Reddy of Alur, Honorary Visitor and Mr. F. E. Smith, Deputy Director of Agriculture, Bengal, paid a visit to the College and Farm.

We have been supplied with detailed lists of contributions from the residents on the Estate to the War Funds. For want of space, we are unable to print them in detail. Practically all have subscribed at the rate of

10% of their salaries, some subscribing more. The collections sent through the Principal amount to nearly Rs. 800—0—0.

Mr. K. Hanumanta Rao, Retired Head accountant, Salem, has been appointed full time Hostel Steward.

The Students' Club.

Games. The college team played one hockey match towards the close of last term with the Police Reserve and won by 1 goal to nil.

Social. The close of the 2nd term was signalised by a well arranged social gathering in the hostel quadrangle.

The Officers' Club.

We regret that we omitted to make mention in the last issue, by an oversight, of the contribution to the evening chats by Mr. A. K. Menon, Oil Expert to the Government of Madras who gave an interesting discourse on *Some Aspects of British life*. During December, Mr. Seshaiyar, B. A. L. T. Head Master, Govt. Training Schools, spoke of the *Educational machinery in Madras*, prominence being given to the Secondary School, Final Certificate and Elementary education, and this was followed by a discourse on *Co-operation* by Mr. C. N. Krishnaswami Aiyar, M. A., L. T.

Departmental Notes.

Mr. K. Raghavachari, L. Ag., Asst. Farm manager, Koilpatti has been temporarily transferred as Fieldman, Govt. Econ. Botanist's section.

Mr. M. C. George, L. Ag., has been appointed Agricultural Inspector, Muvathupuzha, North Travancore.

Mr. K. Chinnasami Pillai, Dip. Agri., Fieldman, Govt. Botanist's section, has been permanently transferred to the Colonial Service in Ceylon as Agricultural Instructor on Rs. 60 to 150.

Mr. M. K. Sitaram Chetty, L. Ag., has been appointed Horticultural Instructor in the Lal Bagh, Bangalore vice Mr. H. C. Javarayya, promoted as Supdt. of H. H. the Maharajah's gardens in Mysore.

Mr. T. V. Srinivasachari who was working successfully as Agricultural Inspector in Pudukottah State, has accepted service as Agricultural Instructor in the District Jail, Tanjore.

ADVERTISEMENTS.

This Journal has a wide circulation amongst Zemindars, landholders, experts and agricultural classes of all kinds and is an excellent medium for Advertisements which are invited from the following :—

1. *Manufacturers and importers of machinery* connected with Agricultural Engineering; e. g., Oil engines, pumps, water lifts, presses, rice hullers and all kinds of agricultural implements and garden tools.
2. *Manufacturers of and dealers in all kinds of manures.*
3. *Nursery and Seedsmen*, both indigenous and imported, agricultural, horticultural and arboricultural.
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2. *Application Form.*—Ex-students who have not yet joined the Union are requested to apply to the General Secretary for the Application Form. They are requested to fill up the form and sent it on to the General Secretary along with their Life Subscriptions according to the class of membership they choose to join. The objects of the Union cannot be attained if a larger number of ex-students do not join it. It is not enough in their case if they subscribed for a copy of the journal which is, after all, sold at less than the cost price. Is the appeal made in vain, the appeal based on love to the Alma Mater?

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4. *Employment Register.*—Old Students who may be in need of employment are requested to register their names in the Employment Register maintained by the Union. As soon as a vacancy is announced, intimation will be given to all those whose names are in the register (Registration fee—8 annas, payable in advance.)

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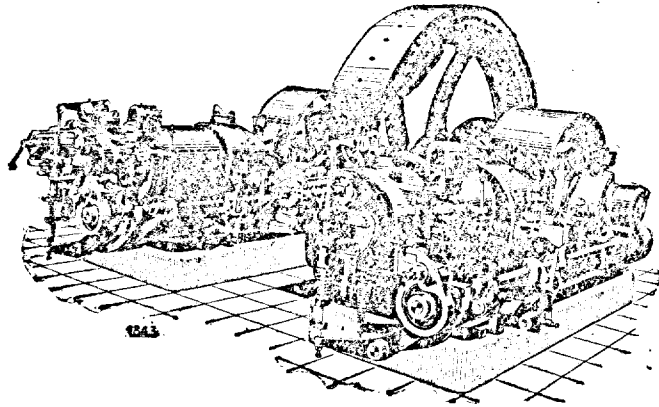
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THE JOURNAL
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The Madras Agricultural Students'
Union.

Vol. III.	February 1915.	No. 2.
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The Indian Science Congress.

The Indian Science Congress, organised after the model of the British Association for the Advancement of Science by the Asiatic Society of Bengal for the second time, was held in January 1915 in the Presidency College, Madras. Judging from the large attendance of delegates who had come from all parts of India, the quality of the addresses and papers read and the nature of discussions, it may be said that the Indian Congress will not take long to reach the ideal of the British Association, and great credit is due, for the success of the Congress, to the organising committee, especially the President, Surgeon General W. B. Bannerman and the Secretary, Professor J. L. Simonsen.

The Congress was welcomed to Madras by His Excellency the Governor, and Surgeon General Bannerman

delivered the Presidential address, his theme being Biological Research with special reference to medicine, a subject with which he was perfectly at home, having been connected with researches on the plague bacillus and inoculation, from the year 1896 when plague first came into India. Agriculture and Applied Sciences, Physics, Chemistry, Botany, Zoology, Geology and Ethnography were the different sections and they were presided over by eminent scientists.

The existence of an Agricultural section in the Science Congress was not generally known and this was unhappily the cause of the remark which His Excellency made that there were few Indians who were to read papers in the Agricultural section. All the same the Agricultural Department of Madras was fairly well represented, the Director of Agriculture, 4 or 5 gazetted officers and half a dozen assistants being present. Dr. H. H. Mann, Principal of the Poona Agricultural College presided over the section of Agriculture and Applied Sciences and delivered an interesting address on "the lines of development of Indian Agriculture." To some people who think that agriculture is "simply an art, a trade, a profession, an industry, call it what you will, which involves the application of a number of Sciences", a separate Agricultural section in the Science Congress may be an anomaly. But the British Association has set the precedent within recent years by having a separate Agricultural section, and we believe that, in future, this section will take the foremost place in the Congress, as there are so many Agricultural

Research Specialists all over India. With his previous vast experience as Scientific officer to the 'Tea Planters' Association in Northern India and as Principal of the Agricultural College and Agricultural Chemist of Bombay, and with his intimate knowledge of the economic conditions of the people, especially of Bombay, Dr. Mann fulfilled the duties of the first Vice-President of the section in an eminent manner and his sympathetic address was characteristic of the man. He pleaded that extensive system of agriculture, involving little capital and bounded by the conservatism of the Indian cultivator on one side and climatic and other problems over which he has no control on the other, should gradually give place to a more scientific and intensive farming. He drew particular attention to the urgent need for increasing underground sources of water by the opening of artesian and subartesian supplies, the ryot's greatest trouble being the fickle monsoon.

Mr. Howlett, Imperial Pathological Entomologist, Pusa read a paper on "Chemical Entomology" in which he explained that insects could easily be influenced by the sense of smell and illustrated, with the help of lantern slides, flies being attracted to pieces of paper which had the faintest trace of chemicals like iso-valeraldehyde or eugenol.

Dr. L. C. Coleman of Bangalore and his Mycology Assistant, Mr. Venkata Rao were responsible for 2 papers on the *Black Rot of Coffee* and the *Koleroya of the Arecanut Palm*.

In the Botany Section, Dr. C. A. Barber, Government Sugarcane Expert, was the Vice-President. Equally with Dr. Mann, he has an intimate knowledge of India. He is the oldest Botanist in Southern India and has seen more service than any other Agricultural officer in Madras. The Subject he chose for his address was "Sugar and Sugarcane", which he treated in his usual masterly style, going into a historical review of the subject, the conflict between sugarcane and sugar beet, the diseases of sugarcane and the lines on which sugarcane is proposed to be improved at the Chettipalayam Cane Breeding Station. Dr. Barber stated that he had already succeeded in raising 40,000 seedlings of cane which are being rigorously selected, with due reference to chemical, botanical or agricultural merits or defects.

A number of papers were contributed to this section, and, in fact, this was one of the best attended and longest sitting. Of these, may be mentioned "Some of the Mendelian characters of the Paddy Plant" by Mr. F. R. Parnell, Government Economic Botanist, which was profusely illustrated with charts, "The Depressed Habit of Sugarcane" by Mr. T. S. Venkataraman, illustrated by lantern slides and the "Flora of Madras" by Mr. C. Tadulingam who has done extensive work in Systematic Botany in Madras.

In the Geology section, Mr. M. R. Ramaswami Sivan read a paper on the "Possibilities of developing a number of Industries in the Cretaceous Formation in

Trichinopoly," with the help of specimens gathered in the locality.

Although not connected with Agriculture, a description of the work of the Science Congress will be incomplete without a reference to Mr. C. V. Raman who presided over the Physics section and delivered the Sir Subramania Aiyar University Lecture on his original researches in Acoustics.

The visit to the newly established Madras Water Works under the superintendence of Mr. J. W. Maddely, the hospitality of His Excellency the Governor at the garden party at the Government House and the final meeting and leave taking in the spacious Bungalow of Surgeon General Bannerman, brought the scientists into closer touch than the learned papers and discussions would have done by themselves; and many is the friendship which has been formed between co-workers in different parts of the country.

A New Rice Pest.

The old proverb 'There is many a slip between the cup and the lip' comes home to none so truly and painfully truly as to the poor cultivator. One rain too little, one rain too much, one contrary wind when the ears are filling, a disease to the plant as it grows, an unwelcome shower when the harvest is ripe for the sickle, all or any of these is enough to dash down the cup of prosperity. The inevitable natural agencies being left aside, attempts are now being made to prevent or remedy the diseases prevalent, with some success. There are as many diseases in the

plant world as there are in the animal kingdom. The agents that cause the malady range from the minute organisms to highly developed ones. Of the many insect pests that attack the rice plant the stem borer (*Schoenobius Bipunctifer*) is said to be responsible for the decrease of about ten per cent in the yield every year. To make matters worse, a disease, locally called 'Than-deethu' or 'Anaikkombu,' has assumed serious proportions and mercilessly attacks the rice plant. The ever superstitious ryot is ready to attribute this to the wrath of the village goddess and runs for rescue to the village poosari (priest) who pretends to know the method to charm away the disease. Some ascribe it to thunderstorms or to the cloudy sky or to westerly winds, over all of which man has no control. Some of the remedial measures suggested are the application of neem cake, groundnut cake, pig dung and so on. The result, however, is not altogether satisfactory.

My recent observations in the fields may be stated in the Journal. When such plants are taken and carefully dissected, one finds a small reddish brown maggot, with a somewhat black streak along the dorsal side, feeding on the growing tip. The petiole, appearing, as it does, like a very fine tube with the leaf base constricted at the top, serves as a chamber for the maggot. As the plant grows, the maggot grows into a bright reddish larva inside the elongating chamber. The larva pupates in a case which looks like a cluster of eggs overlapping each other. The pupa case is generally found near the upper constriction whence it escapes outside as a fly by eating up a hole on the side of the chamber. The part being weakened at the hole breaks and the leaf blade falls down. Now the affected part presents to view a white or pink hollow tube, according as the crop is of the long or short duration variety. It is on account of

this white tusklike projection ryots call the disease "Anaikkombu" or 'Ivory disease.' The growing part being thus affected, branches shoot from the node next below. A badly affected plant with leafy branches looks like *Varagu* (*Paspalum Scrobiculatum*), of course, with no earheads.

The impudent fly is more or less musquitolike in appearance with a pair of antennae or feelers, each about a fourth part of an inch in length. The abdomen is pale white and pointed towards the anal end. This lays eggs singly on plants.

Fortunately the insect is not left unchecked to work havoc in the fields. A very small fly known as a chalcid, less than a pinhead in size, parasitises the maggot by laying its eggs on its body. The larvae hatching from the eggs feed on the non-vital organs of the maggot inside till it finishes up its pupa case. Now the chalcid larvae feed on the vital organs and finally, after eating up the maggot, pupate in the same case. Out of this, a number of chalcid flies come out to do the beneficial work. Yet these useful insects which appear rather late in the season cannot prevent the heavy loss which occurs to an appreciable extent. Long duration Samba is found to withstand to some degree while the short duration varieties suffer most.

K. R. SANKAR,
Farm Superintendent, Pudukotta.

Cultivation of Colocasia (Chemboo) as practised in South Malabar.

Varieties:—There are three varieties:—1 Ordinary (Sadharana) 2 Notti and 3 Kizakkan. Leaves and leaf stalks of No. 2 are bigger than No. 1. No. 3 is the biggest, the tuber of which is stout and is 6 inches to 2 feet in length; the colour of the tuber

and leaf stalk is generally reddish. Seed tubers of the first two can be had at about 2 as. per 100, whereas Kizakkan tubers cannot be had for anything less than Re 1 per 100. On the whole Notti is the best and most paying variety.

Soil:—All the above varieties are generally grown in the laterite and loamy soils of the District. Red loams probably are best suited. Chemboo is cultivated in dry and wet lands; if in the latter, they must be of a slightly higher level and fairly drainable.

Cultivation as adopted in the wet land:—To avoid failure in germination and economy in watering, germinated seeds are generally planted out. Seed is first immersed in cowdung water for about two hours, kept in loose soil nursery for two weeks and the nursery is slightly watered daily. In February—March germinated tubers are planted out in circular pits, more than a foot in diameter and 9 inches deep, leaving a distance of 3 feet from the centre of one pit to the other. Pits are made on slightly raised beds. 3 or 4 tubers in the case of the first two varieties are planted in each pit and only one tuber in the case of Kizakkan. The pits are in all cases manured with dried cattle manure at the rate of two seers per pit. Kizakkan is planted 2 or 3 weeks earlier. About 30 days after planting, pits are weeded, slightly hoed and manured with dried cattle manure at about a seer per pit. In June, after getting a few showers, the pits are opened out slightly, another dose of cattle manure at the above rate is given and green leaves at about 2 or 3 lbs. each pit are also applied. Pullangi (*calyopteris floribunda*) leaves are considered to be the best. Over the leaf, earth is also thrown and it is taken from the opposite sides of the pit so that a drainage channel is made between the rows of chembu pits. It is not uncommon to mix some ashes also with cattle manure for the 2nd and 3rd manuring. Hand watering is given till the

beginning of the rains once in 4 or 5 days. Nothing else is done till the crop is harvested in August.

There is no doubt the crop is a very paying one. From 4 pits, about a riddleful of tubers worth 4 to 8 as. is obtained. Roughly the yield is about 40 fold in good lands.

A second crop of paddy is often raised in the land after the harvest of chembu.

Cultivation in the dryland:—Planting is done in May after a few showers have been obtained. Crop is harvested in November. No irrigation is necessary and other treatment (manuring etc) is exactly as detailed above.

Seed:—It may be noted that chembu cultivated in the wet land is more tasty and easily digestible but it does not keep very long. The tubers selected out of the dryland harvest has therefore to be preserved in pits for seed. Some ryots keep a few pits unearthed till the planting time. The germinating tubers are dug out and planted straight away at the proper time.

M. GOVINDA KIDAVU,
Farm Manager.

Sadai Samba cultivation in the Gobichetti-palayam Taluk.

The cultivation of this variety of paddy is confined to the lands under the branch channels from the main ones of the Bhavani river where water is allowed from 15th June to 15th November to these reaches. This is a heavy yielder when treated in the 'dry seed bed' system. As much as 30 salagais or nearly 5000 lbs. are obtained. The object of the ryots is to raise seedlings so as to enable them to plant them by the end of June

or beginning of July as this is considered to be the best season for it. Several ryots resort to the practice of ploughing up a small area near the main channels by hand watering it and then preparing it for sowing paddy seed beds. After 3 or 4 ploughings, cattle manure or ashes is applied and ploughed again. The paddy seed is broad-casted and covered by ploughing or in some cases by merely levelling the field with a mammatti or by hands. The ryots prefer to have only small areas and thick sowing, as much difficulty is experienced when a large seed bed is to be watered. Further the roots tear asunder if the seed beds are thin and when the seedlings are pulled out carelessly. The seedlings are planted in 40 to 45 days. The soil is coarse alluvium with excellent drainage. The yield is much more than that of the other varieties i. e. Ayan Samba, Anai Komban or Kar which are grown on their respective reaches. Bunch planting is resorted to. The lands are manured heavily with cattle manure, or silt. The seedlings take root soon after planting and begin to tiller profusely and cover the ground fully although they are transplanted about 9" apart. The ryots are aware that planting far apart gives them better results. The work of the Agricultural Department this season is important in that the usual seed rate of 30 Madras Measures per acre has been considerably reduced to 3 to 6 Madras Measures per acre and may be said to be at the minimum in some cases. Through the continued efforts of the Agricultural Department, single seedling transplanting was adopted in most of the cases by the ryots and thin planting in a few cases where ryots were afraid to try the experiment for the first time. A seed rate of 3 Madras Measures per acre was found to be ample in some cases and the nursery seed rate was 1 Madras Measure in 2 cents i. e. half the rate advised generally. An inspection during the growth of the crop disclosed that the ground is fully covered and the crops have tillered profusely, usually with over 30 tillers. About 100 acres may be seen transplanted singly

with this variety in 7 villages of this Taluk in this season and about 200 acres with Ayan Samba and Anai Komban in half a dozen villages and about 37 acres with Kar in one village. Thus single seedling is spreading rapidly in this Taluk

W. RAGHAVACHARI,

Ag. Farm Manager.

*** The need for Agricultural Organisation.**

Within the last few years, the Government have reorganised their Department of Agriculture. They have established a College of Agriculture and Research Institute at Coimbatore and Farms in important centres, for experimental and demonstration purposes. The result of the research work, the experimental work and demonstration work are published in bulletins and pamphlets. The Government, in organising the Department of Agriculture, has in its view the introduction of improvements in the methods of agriculture as practised hitherto and to combat the insect pests and fungoid diseases of the crops. When it is remembered that eighty per cent of the population of this country depend upon agriculture for their living, and that the revenue derived from land by Government constitutes more than sixty five per cent of the total income, it is natural that the Government are anxious to see to the prosperity of the agricultural classes. But, in spite of the best efforts of Government, can we honestly say that improvements in agriculture have been effected in any appreciable manner, that new methods have taken the place of old, except in a few isolated instances?

Dr. Volcker says that at his best the Indian ryot or cultivator is quite as good as, and in some respects superior to, the average British farmer, and that at his worst, he will struggle on patiently and uncomplainingly in the face of difficulties in a way that no one else would. Yet how is it that modern methods and improvements advocated by the

* Summary of paper read at the last Agricultural Conference by Mr. C. R. Lakshminaraha Aiyangar, B. A. B. L., High Court Vakil and Secretary, Agricultural Association, Kumbakonam.

Agricultural Department are not readily and eagerly adopted by the bulk of the agricultural community? It is not my province, nor my purpose to find any immediate solution—it is a very difficult problem in solving which the State and the Subject are alike interested. The improvement of agriculture depends a great deal upon the people themselves.

Better methods of cultivation and improvements in agricultural practices could only be pointed out by the Department and it is for the people to adopt them or not. The question then is how to familiarise the ryot and induce him to adopt the improved methods of agriculture. My answer is through agricultural organisations. The next question is, what they are and what form they should take and what are the conditions necessary to make these organisations successful in achieving the object in view. These again are very difficult to define exactly and I can only indicate some views which occur to me, as the result of my own experience.

The two chief forms or types of agricultural organisations which exist are:—Agricultural Associations and Co-operative Agricultural Societies. The Agricultural Associations started in many Districts some ten years ago owe their failure to their having had no definite object in view and that the aid of the Agricultural Department in those cases was neither sought for nor given. Such of the Associations as have survived owe their life and activity, to their having had a definite programme in view, and which have had the benefit of the advice of the Agricultural Department and the sympathy of the Revenue Divisional Officer. The effort of Government must be to bring the Agricultural Associations into closer touch with the Department of Agriculture, and so to shape their working as to be in conformity with a system laid down by the Department. The Officers have to study local conditions and needs, win the confidence of intelligent ryots, and try through them to effect the improvements. A successful demonstration plot on the land of a private member of an Association, is of much more educative value, than one at a Government Farm. I fear, much is made of the failure of those Agricultural Associations which were started throughout

the Presidency, to draw from it the inference that they are not suited to the conditions of Indian Agriculture. Agricultural Associations having been given up as failures, something had to take up their place and the modern tendency is to encourage to start Co-operative Agricultural Societies in their stead. Within the last ten years the Co-operative Credit movement has advanced in rapid strides. From the exceedingly interesting progress report published not long ago in the Gazette of India, it will be seen that the Co-operative Credit movement has already brought relief to six millions of people, a gratifying and indeed phenomenal outcome of the work of ten years. The report goes on to say "It is true that there is still only one Agricultural Co-operative Society in India for every 20,000 of the population engaged in Agriculture, whereas in Italy there are eighteen and in Germany thirty-two." But the movement is only at the beginning. It may be noticed that it was only in 1912 that the Co-operative Act was extended to cover Societies other than those organised for credit and the small number of Societies started since then, are yet in their experimental stage. It is no wonder that, in India where the bulk of the agricultural community is heavily indebted, the advantages of co-operative credit have been availed of with an avidity which was natural. But how far Co-operative Agricultural Societies can be depended upon to solve the problem of improving Indian Agriculture it is too soon to say. Even in England the proportion of Co-operative Agricultural Societies to other credit and trade organisations is very small, and the principal types of successful Agricultural Societies are Dairies and Creameries.

It will be seen that that the Co-operative Agricultural Society is a business concern organised solely with a view to profit. It has to confine its operations to a few items of definite work, such as the purchase and sale of seeds, manure, or implements suited to the agricultural requirements of the tract. Generally speaking it has also a limited working capital. It is beyond its scope to carry on any propaganda or demonstration work, and the working of the society is of a spasmodic nature. For instance, the members of a society dealing in seed and manure—all require them more or less at the same time. A consolidated indent is

given, the seeds are obtained and distributed. There the work for the season stops. Similarly with manure.

Again with a capital of about Rs. 1000 or 2000, it will be out of place to think about buying all agricultural requisites, to sell co-operatively all the crops of the members, to manage cattle breeding and run a dairy, to stock improved ploughs and implements and, so forth; and the absurdity of aspirations like these is apparent; and when a society formed on such ambitious lines is, in practice, found not to be fulfilling the expectations, it is no wonder. I am pointing out the difficulties involved in introducing tangible improvements in agriculture through means of cooperative societies. To give my experience of Tanjore Co-operative Agricultural Society, the society was started in 1912 with the object of co-operative buying and selling of seed, manure and implements. When I wanted to supply to the members good seed, I asked my members whether any of them would supply good seeds. None of them would venture to place seeds which they could not guarantee. But every one offered to *purchase* good paddy seed. Then I applied to the Deputy Director of Agriculture offering to buy the entire seed which the Department could save from the recently established rice station at Manganallur, but he told me that, since the farm was only recently established, the Department was selecting seeds and he could help me only in the season to come. So we could not make any progress in the seed line. But in the manure line, the society bid in auction and has purchased the cattle depot manure of the Municipality of Kumbakonam. We find ready purchasers for the cattle-manure. So far as night soil manure is concerned, considerable difficulty is experienced in removing it from the pits.

Again with regard to implements, unless we buy collectively there will be very little profit to share at the year's end. The scope of co-operative agricultural societies seems to me to be very limited.

In contrast with a co-operative society, an Agricultural Association is more elastic in its working. Its activity and scope for usefulness are determined only by the energy of its organisers and the length of its purse. It can enlist many members; it can take in donations, can

collect subscriptions. It is not fenced in by any restrictive regulations. It can have demonstration plots and induce members also to demonstrate them on their lands. It can organise shows, and exhibitions—arrange for lectures, give prizes and can publish a journal. The Officers of the Agricultural Associations are the better media for the introduction of actual improvements in agriculture, and it is bad policy to discourage their formation or suggest their winding up.

In my opinion Co-operative Agricultural Societies must be made adjuncts to Agricultural Associations and it is through these that improvements in Agriculture can be made to reach the ryot. And in order that these Associations and Societies may be really successful, they should have cooperation of the Officers of the Agricultural Department and the Revenue Divisional Officer or Collector of the District. This does not involve the idea of officialising these organisations.

The number of Co-operative Agricultural Societies and Associations now working can be counted on one's fingers. Fresh societies and associations should be organised, on lines different from what they have been, based on past experience. If it is not presumptuous of me to say, the Central Agricultural Committee at Madras should be reorganised on new lines—possibly on the line of the Ceylon Agricultural Society which has a membership of over a thousand and a monthly journal edited by an Agricultural Expert, commanding a large circulation. The District and Taluk Associations may or may not be affiliated to the Central Committee. What seems to me to be of most importance, is that the associations must have a programme of work, constantly kept before their view, by the persistence of the Agricultural Officer of the District. We were all very glad to hear that the department is to be considerably strengthened and we hope that each District will very soon have its Agricultural Inspector. Similarly in starting Co-operative Agricultural Societies, some definite and clear object suited to local needs must be kept in view. We feel that we are not in our proper element in organising and working these concerns, that we have not got the requisite agricultural knowledge or training, or leisure, to work

them successfully; but one can't help it at this stage. But the future is, I dare say, full of hope.

Notes.

We very much regret to record the untimely death of Mr. L. Srinivasa Das, L. Ag., Agricultural Teacher in the Municipal High School, Anantapur. He joined the college in 1910 and took his Diploma in 1913 and impressed the staff as a very intelligent young man. He attended the last College Day and, from the conversation we had with him at the time, he was enthusiastic about his work at Anantapur and was very hopeful of turning out work, practically useful to the ryots of Anantapur. The hopes have been shattered and we convey our sincere and heartfelt condolence to his father Mr. L. Subbanacharlu and to his young widow.

The Agriculture Trade Conference:—The conference was presided over by the Hon'ble Mr. L. E. Buckley I. C. S., Commissioner of Agriculture; and comprehensive notes and points for discussion had been previously prepared by Departmental Experts under the following subjects and circulated to the members:—1. Cotton. 2. Groundnut. 3. Sugar. 4. Manures. 5. Coconuts. 6. Tobacco. 7. Jute. 8. Wool. 9. Implements. and 10. Well irrigation by power. The several committees, in which representatives of the Trading Firms, and landholding classes were present along with Departmental officers, discussed the questions in detail and expressed their opinions in the form of resolutions. These discussions and resolutions were then published, from time to time, in the newspapers and there is no need to go into them here. The object of the Conference was to get the cooperation of the trading firms and landholders in the work of the Departments of Agriculture and Industries, and we believe that this help was given more freely at

these informal meetings than it would have been if there was a larger congress or if a mere expression of opinion was asked for, privately, by letter.

The Imperial Agricultural Chemist has decided to discontinue to acknowledge the academic distinction "Ph.D." "Doctor of Philosophy" which he gained in Germany and would not like to be addressed as Dr. J. W. Leather in future, the reason for this attitude towards his *alma mater* being that the Professorial staff at the Universities in Germany have greatly assisted in encouraging the idea of the present European War. Certainly teachers, i.e. those entrusted with the training of young men, have a different duty to perform from inciting them to war.

Mr. Vengail Krishnan Nayanar writes from Kavaye, N. Malabar, that, owing to the decease of the late Hon'ble Mr. V. Kunhiraman Nayanar, he has assumed charge of the estates of his Tarwad, which imply very considerable responsibilities. We wish Mr. Vengail Nayanar every success in the task he has before him and are glad to see that he intends to keep up his interest in agricultural matters. He writes that his duties as Vice-President of the Madras Agricultural Students' Union will still have his best attention and that he hopes shortly of visiting Coimbatore.

Cyanogenetic glucosides in fodders:—Our readers know that cattle die occasionally by eating young cholam plants and that the cause of death is due to the liberation of hydrocyanic acid in the system by the action of the digestive juices on the cyanogenetic glucosides which are largely present in young plants and absent in mature ones.

In a series of estimations on the amount of hydrocyanic acid yielded on hydrolysis by various feeding stuffs, it is found that young plants of sorghum less than 2 feet high gave from '006% to '045% of the acid, which became reduced as the plants grew older and was completely absent in full grown plants, long before maturity. M. R. R. (*From the Analyst*).

Grafting:—Horticultural Experiments carried out by Messrs. Veitch and Sons, at the suggestion of the late Professor Romanes, throw light on an important phenomenon that plants belonging to the different genera of the same natural order can be successfully grafted to a certain extent, examples of such grafts having been grown at Coombe Hill nurseries. Thus Cambodia cotton may be grafted with tree cottons, and cotton with the portia tree. K. C. J. (*From Knowledge*).

Thick versus Thin Canes for planting:—Certain experiments conducted in Argentina show that, in choosing cane pieces for planting, the thickness of the pieces is of no account, what is wanted being a rigorous selection for healthiness and freedom from disease. T. S. V. (*From the International Sugar Journal*.)

Cane Sugar and Heart Disease:—Dr. Glouston, an Exeter physician has been using sugar for the treatment of certain kinds of heart disease for the past 13 years with some remarkable results and has established, by numerous clinical observations, that the ingestion of sugar has a specific action on the nutrition of the musculature of the organ which is of great value in cases of irregular, dilated or feeble heart. For this purpose he recommends only cane sugar and not beet sugar. T. S. V. (*From the International Sugar Journal*).

Estate Notes.

Mr. B. Coventry, C. I. E., Agricultural Adviser to the Government of India, visited the Estate in January 1915, paying particular attention to sugarcane experiments in Chettipalayam and paddy selections in the Government Botanist's section. He went over to Calicut to enquire chiefly into the Cocoanut industry.

Honour Boards have recently arrived and will be put up in the Big Lecture Room in the College. They will perpetuate the names of those who have held the posts of Secretary to the Club and Captain of

Games. We believe that Honour Boards for the Medallists will also be put up later on.

There are now 5 oil Engines on the Estate, the responsibility for running them being divided between the College and Farm Mechanics:

1. The new Portable Engine running the College well, Pump and the Dynamo.—12. H. P.
2. The Farm Well Engine.—9. H. P.
3. The Farm Workshop Engine.—9. H. P.
4. The new Engine for supplementary water supply in Field No. 60.—9. H. P.
5. The small Engine at No. 57 well.—3½ H. P.

We beg to offer our sympathy to Mr. K. Unni Krishna menon, Farm manager, Central Farm, whose talented young wife died suddenly at the house of her father at Kottakal.

A Government Servants' Co-operative Society, on the model of the Madras Society, has been formed in Coimbatore and the Indian staff at the College have taken a large number of shares in the Society which will serve the purpose of effecting easy savings, affording loans and running chit funds. The Rules of the Society have been approved of by Government, and Govt. Servants alone are eligible to hold offices, while, in every other form of cooperative organisation, Government servants may join but cannot act as office bearers.

Mr. C. N. Subramania Aiyar has been successful in rearing some fine bunches of grapes in his house. We congratulate him and hope that one day we may be able to have a Fruit and Flower Show of local interest.

About 20 officers on the Estate attended, among others, the First Aid classes conducted by Rao Sahab K. M. Madhava Menon, Acting District Medical and Sanitary officer, Coimbatore and the following

received certificates:—Messrs. M. R. Ramaswami Sivan, T. S. Venkataraman, K. Krishnamurti Rao, B. V. Nath, P. A. Raghunathaswami Aiyangar, K. Ramiah, G. N. Rangaswami Aiyangar, T. S. Venkatarama Aiyar, K. Unni Krishna Menon, K. T. Bhandary, Y. Ramachandra Rao, K. Puttayyar, P. Ramaswami Aiyar, M. K. Subramania Pillai and T. Lakshman Row. The above, along with other students of the First Aid classes from Coimbatore, gave a delightful entertainment, by kind permission of the Government Botanist, in the College Botanic Garden, to Drs. Madhava Menon, Raman Menon and Krishna Rao; and a group photograph was also taken by Mr. Raju Naidu of Coimbatore.

The Officers' Club.

During January, Mr. K. V. Joshi, B. Ag., Superintendent, Alibag Farm, Bombay Presidency, who had come on tour here in connection with a study of paddy cultivation, spoke on Paddy cultivation in Bombay and this was followed by a discourse on Paddy cultivation in Madras by Mr. R. Ramaswami Aiyar.

A Foot Ball Section has been added to the Officers' club.

The Officers' Club has an excellent, though novel, method of catering to the literary tastes of the members at the smallest expense possible. The right of the use of the daily newspapers at night is auctioned and realises about half the cost of the subscription. The journals are circulated at night and the circulation members pay half the cost of journals and themselves arrange for circulation. After the circulation is over and new journals are received, the old copies are taken up by members who pay not less than half the cost. The bidding for the use of newspapers, for the circulation of journals and for the purchase of old numbers of journals takes place in advance in February and holds good for 1 year. The result of the above arrangement is that 4 dailies and over 14 monthly and weekly journals are laid on the table during the Club hours, 8 A. M. to 8 P. M. daily for the use of all members, while those members who do not find it convenient to read

in the Club can have the papers home for an additional subscription. The Scheme works well and should work well, so long as the spirit of community of feeling exists. More funds are wanted to make additions to the Club Building, for instance, and it is but right that members should economise expenditure in all possible ways. The literary side of the Club, which is generally a costly item in most places, costs little or nothing in this Club.

The Students' Club.

The third year students were treated to a most amusing entertainment by the staff of the Koilpatti Farm. After various professional entertainers, the farm coolies produced a farce purporting to be a scene in the life of an agricultural officer engaged in cotton work. The idea was well worked out and splendidly produced. The absolute indifference of the villagers, gradually changed to toleration on the production of some, no doubt admirable, snuff and ended in a grudging promise to sow a fraction of an acre with the *gorru kalaṭṭai*. Considering that the majority of the performers could neither read nor write and that the production was entirely their own idea, it was extraordinarily good. Another scene depicted the newly joined Assistant Farm Manager receiving his instructions from the Farm Manager, the part of the latter being taken by the maistry.

The annual Tennis Tournament for the Cecil Wood Cup, presented by Mr. B. Dwarakanath, will be decided about the first week in march.

Hockey badges for those who have received their colours have been obtained and the next appearance of the team is eagerly awaited.

Since writing the above, two matches were played, one with the Gymkhana and the other with the Coimbatore College, with the result that we won both the matches, the first by 2 goals to nil and the second by 6 goals to nil.

Some Weeds of the Central Farm, Coimbatore.

Papaveraceae.

Argemone mexicana, Linn (naturalised)	Birama Dandu or Kurukkan chedi.	பிரமதண்டு or குருக்கன் செடி.
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Capparidaceae.

Cleome viscosa, Linn.	Nai kadugu	நாயக்கடுகு
Cleome Chelidonii, Linn		
Gynandropsis pentaphylla, DC.	Velai.	வேலை

Violaceae.

Ionidium suffruticosum, Ging.	Orilai thamarai Purusharatnam.	ஒரிலைத்தாமரை புருஷரத்னம்
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Polygaleae.

Polygala chinensis, Linn	Milkwort.	
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Portulacaceae.

Portulaca oleracea, Linn.	Pasarai or Paruppukirai	பசரை or பருப்புக் கிரை
Portulaca quadrifida, Linn.	Sirupasarai.	சிறுபசரை

Elatineae.

Bergia ammannioides, Roxb.		
Bergia verticillata, Willd.	Nandukkarkirai.	நண்டெக்கார் கிரை

Malvaceae.

Malvastrum tricuspidatum, A. Gray (introduced)		
Sida humilis, Willd.	Pazham Pasi.	பழம் பாசி
Sida mysorensis, W & A.		
Sida spinosa, Linn.		
Sida carpinifolia, Linn.	Arivamookku keerai.	அரிவாமூக்கு கிரை
Abutilon indicum, G. Don.	Tutu.	துது
Payonia glechomifolia, A. Rich.		

Pavonia zeylanica, Cav.	Sithamutti.	சித்ரமுட்டி
Hibiscus micranthus, Linn.		
Hibiscus panduraeformis, Burm.		
Hibiscus vitifolius, Linn.		
Hibiscus ficulneus, Linn.	Kattubendai or Kasturibendai.	காட்டுபெண்டை or கஸ்தூரி பெ ண்டை

Tiliaceae.

Triumfetta rotundifolia, Lam.	Mudappoond.	முடப்பூண்டு
Corchorus olitorius, Linn.	Perumpunnakku Poond.	பெரும்புண்ணாக் குப் பூண்டு
Corchorus trilocularis, Linn.	Punnakku Poond. or Vazhukkai Poond.	புண்ணாக் குப்பூ ண்டு or வழக்கை ப்பூண்டு
Corchorus fascicularis, Lam.		
Corchorus acutangulus, Lam.		

Zygophylleae.

Tribulus terrestris, Linn.	Nerinji.	நெரிஞ்சி
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Sapindaceae.

Cardiospermum Halicaca- bum, Linn.	Mudakkathan.	முடக்கத்தான்
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Leguminosae.

Crotalaria mysorensis, Roth.		
Crotalaria verrucosa, Linn.	Gilugiluppai	கிலுகிலுப்பைச்செடி
Indigofera enneaphylla, Linn.	Seppunerinji.	செப்பு நெரிஞ்சி
Indigofera viscosa, Lamk.	Kavelai Chedi.	காவேலைச்செடி
Indigofera trita, Linn.		
Indigofera parviflora, Heyne.		
Indigofera articulata, Gouan.		
Tephrosia spinosa, Pers.	Mul kolinji.	முள் கொளிஞ்சி
Tephrosia purpurea, Pers.	Kolinji.	கொளிஞ்சி
Alysicarpus monilifer, DC.	Kal namap- poond.	கல் நாமப்பூண்டு

<i>Alysicarpus rugosus</i> , DC.	Namappoondu.	நாமப்பூண்டு
<i>Desmodium diffsum</i> , DC.		
<i>Desmodium triflorum</i> , DC.		
<i>Teramnus labialis</i> , Spr.		
<i>Phaseolus trilobus</i> , Ait.	Naripayathan kai.	நாரிபயத்தன் காய்
<i>Clitoria Ternatea</i> , Linn.	Kakatton or Kuvilai.	காக்கட்டான் or குவளை
<i>Rhynchosia minima</i> , DC.	Neela alumu.	
<i>Cassia occidentalis</i> , Linn.	Payavarai.	பேயாவாரை
<i>Cassia Tora</i> , Linn.	Oosithagarai.	ஊசித்தகரை

Lythraceae.

<i>Ammannia Rotala</i> , F. Muell.		
<i>Ammannia baccifera</i> , Linn.	Kalluruvi or Neermael neruppu	கல்லுருவி or நீர் மேல் நெருப்பு
<i>Ammannia salicifolia</i> , Monti.		

Onagraceae.

<i>Jussiaea repens</i> , Linn.	Nirkrambu.	நீர் கிராம்பு
<i>Ludwigia parviflora</i> , Roxb.		

Cucurbitaceae.

<i>Cucumis pubescens</i> , Willd.	Thummatti.	தும்மட்டி
<i>Citrullus Colocynthis</i> , Schrad.	Paykummatti.	பேய்க்கும்மட்டி
<i>Cephalandra indica</i> , Naud.	Kovai.	கோவை
<i>Ctenolepis Garcini</i> , Naud.		

Ficoideae.

<i>Trianthema monogyna</i> , Linn.	Sharanai.	சாரணை
<i>Trianthema crystallina</i> , Vahl.	Siru sharanai.	சிறு சாரணை
<i>Trianthema decandra</i> , Linn.	Vellai sharanai.	வெள்ளைச் சாரணை
<i>Orygia decumbens</i> , Forsk.		
<i>Mollugo hirta</i> , Thunb.		
<i>Gisekia pharnaceoides</i> , Linn.	Manali keerai.	மணலிக்கீரை

C. TADULINGAM.

(To be continued).

THE JOURNAL

OF

The Madras Agricultural Students'
Union.

Vol. III.

March 1915.

No. 3.

Dairy Farming.

In European countries where agricultural practices are conducted on scientific lines, dairy farming has been of late becoming more and more popular. Together with stock breeding, it has in many instances replaced cereal growing. Essex, which was originally a county of arable farming worked by English farmers, has given place largely to dairy farming and stock rearing introduced by Scotch farmers who settled down there not long ago. The reason evidently is that dairy farming is much more profitable than arable farming when it is run on business lines. But if we turn our attention to India, things appear to be very different. There is hardly a dairy farm worth the name at the present moment. It has not caught the fancy of the ryot. Even the so-called agriculturist educated on modern lines looks

at it with suspicion. He would rather have 100 acres of dry land than sink his money on dairy farming which appears to him such a speculation. When pressed for a reason, he would cite a man here and a man there who has wrecked himself on this dangerous rock. Failures occur everywhere; even in America and Britain where up-to-date methods are adopted, there are farmers who have failed in their business. The cause is not far to seek. The Dairy farmer, like the manufacturer, ought to be able to calculate what his products cost him and what the sources of his profit and losses are. In other words, he should make dairy farming a business concern and study the conditions which would bring him the most profit.

We may consider the main ideas a dairy farmer ought to have before him to make his business a success. In the first instance, one naturally turns to the land. The suitability of the soil as regards its composition and value is no doubt of great importance. But this is not all. The principal cause of low yields is not so much the impoverished state of the soil as the want of proper preparation and tillage, because many so-called poor soils have an abundance of plant food for several crops. The dairy farmer should, however, use manures to keep up the fertility and take accurate accounts of them. It must also be his aim to grow suitable crops suited to his soil and method of farming. Forage crops are to be supplemented by cakes, the aim being to maintain the soil fertility. The dairy farmer should so utilise his crops as to remove the minimum amount of fertility elements in the finished product. Such removal can be replaced either by manu-

ring the land or by feeding the animals with concentrated food. The latter is more profitable as it tends to serve the purpose of feeding the animal as well as of eventually restoring fertility to the soil in the shape of dung cast by the animals. Pasture grounds should always be available on dairy farms and plentiful water supply within easy reach of the animals. While grazing, the animals obtain exercise which is necessary for their health.

The next thing to consider is the breed. Very little is known in India with regard to the particular breeds suited specially for dairying. A beginning can anyhow be made by any dairyman. He can, so to speak, make up his own breed. The chief point to aim at is that his animals come from a milking strain, as far as possible, such cows as combine quantity with quality. Animals with a fairly long period of lactation coupled with regularity in calving are no doubt points worth aiming at in a milking herd. It is impossible for one to say which is the best breed because it greatly depends upon the individual needs and tastes of the dairyman, and what is considered best by one may not suit another equally well.

It is to the advantage of the dairy farmer if he raises his own cows from the best calves. The dairy herd should be perpetuated particularly from the best cows and opportunity should be taken to build up a herd in such a way and, having got it, to endeavour to maintain it. Purchase of cows from outside tends to lower rather than raise the standard because it is not at all likely that the best cows are ever sold.

The third consideration of the dairy farmer ought to be the maintenance of milk records. These are essential for determining profit and loss. Besides, it should be the aim of the dairyman to gradually improve the herd and he can do this by recording the performances of all his cows and at the end of each year by weeding out those which are unprofitable to him. Again, by knowing exactly the capabilities of each individual cow, he can adjust her feed accordingly. This is of utmost importance as most dairy-men lose sight of the fact that they often overfeed their poor cows and underfeed their best milkers.

Fourthly, proper feeding of animals leads to important results and it has to be done as a business. It is necessary to study the requirements of individual animals with regard to the effect of various foods. Feeding standards are excellent, although it must be admitted that they are only guides to the dairyman. These help him to see whether he is feeding too much or too little or giving his animals an unbalanced ration.

Lastly, it is of primary importance that the dairy farmer disposes of his products in a business-like way. Cleanliness is the keynote for successful dairying. Punctuality and tidiness go a long way in ensuring his business a success. He should no doubt know all the tricks of his trade but there is no gainsaying the fact that honesty will pay him in the end. The larger the concern the greater are the chances of success generally. He should make good use of his by-products, and aim at the least amount of waste.

The object of the article is not to theorise what is impracticable. It is to show that even in India, there are successful dairy farms following the lines indicated. We have but recently visited one such and derived much inspiration. We refer to the Military Dairy Farm at Bangalore. The farm is situated just outside the municipal limits with an area of about 60 acres all told. The pasture ground has on it very little grass worth mentioning but the dairy cattle have plenty of free movement and excellent water supply.

A mixed herd of cows and buffaloes is kept. The former has much Ayrshire blood in it. Ayrshire, it must be remembered, is pre-eminently the milking breed of Britain. It is fortunate that Bangalore climate lends itself to such importation of cold country animals. The buffaloes are of Delhi origin. About 1600 lbs of milk are obtained each day, the individual average of the herd being twelve pounds per day. One or two animals give as much as 60 lbs per day. The animals are housed comfortably and are trained to the stanchions so that the food of an animal is not appropriated by her stronger neighbour. An abundant supply of fresh hay is given them in addition to concentrated food. Cows are divided into four classes depending upon the amount of milk given by them, and they are fed with cotton seed meal, cotton seed hulls, wheat bran or rice bran and brewer's grains making a total of twelve pounds of concentrated food in the case of first class animals yielding more than 20 pounds a day and eight pounds in the case of animals

whose daily milk capacity is less than twelve pounds. All classes get twenty pounds of hay equally. Particular attention is paid to animals nearing parturition. Two weeks before calving they are put under special feed and kept in special calving sheds. The calves themselves are tenderly cared for. The pure-bred stock are weaned very early in life and receive special rations which are increased as the calf grows. They are treated to a copious supply of surplus skimmed milk. In all calf sheds pieces of rock salt are hung for calves to lick whenever they choose to. The breeding bulls on the farm are all that could be desired. In addition to liberal quantities of hay and concentrated food, they are given coconut cake to give them a finish. They run with the herd which is not altogether desirable, but the cattle boys are supposed to report at once any cases of service while grazing.

Most of the milk is sold as milk, very little being converted into butter. The milk before being sold is pasteurised at 180° F and cooled to 35° - 40° F and immediately transferred to the cold storage room. The morning's milk is sold in the evening and the evening's the next morning. If customers do not care for the rich buffaloes' milk it is 'reduced' by adding three parts of skimmed milk to seven parts of whole milk. The majority of the butter made is from cream purchased from contractors who are paid the ridiculously low rate of 10½ annas per lb. of butter made from cream supplied. It is surprising to us from our own experience how this can be done; nevertheless this is a fact. The contractor is paid only on the

quality of butter manufactured; if it goes bad it is liable to be returned. The butter is made in an improved "Astra" combined churn and worker having a capacity of ninety gallons. The butter 'comes' within five or six minutes. After washing, 2% salt is added and then the butter-worker is pushed into the churn so that churning, salting and drying are all done in one operation. The texture of the butter remains firm and, soon after manufacture, the butter is removed to the cold storage where it may remain in perfect condition for two months. The whole dairy plant is run by one engine. All vessels are scalded by steam after use. Milk records are kept up to date and milk is frequently tested to see if the proper percentage of fat is maintained.

We were assured and we have no hesitation to believe, that this dairy farm is run on commercial lines and we earnestly look forward to the day when there would be many such dairy farms run with profit and on up-to-date methods.

D. ANANDA RAO.

Reclamation of Saline Land.

There is a large backwater near Coondapur town. With a view of getting this reclaimed and brought under cultivation, I gave out last year about sixty acres of this on cowle terms, of rupees two per acre for five years and rupees four per acre thereafter, to a number of private persons. The lands were sold by auction for the most part and fetched about Rs. 65 per acre. On inspecting these lands this morning I was interested to see the

first steps which the people were taking to bring them under cultivation. Normally the lands are submerged by salt water at high tide and the first thing they do is to exclude this by building a high mud bund, sometimes faced with stone, leaving an opening for flood-water to escape. Very large quantities of sea sand are then brought in dugouts and spread over the surface till the level is sufficiently raised. A thick layer of mud from the river is then spread on the top of the sand. When the monsoon comes the first rain water is impounded in the field, and kept on the land for about a month, when it is let out, and a coarse salt-resistant paddy* called 'Kaggu bhatta' is sown broad-cast. This year being the first, the crop grew very well till the rains stopped (about October) when the salt, no longer being diluted by the rain, became concentrated, with the result that the crop, then just maturing, was 'burnt up' and gave a very poor yield. The outlet to the backwater is open and a good deal of drainage water is still running off from the field. The same process will be repeated next monsoon, and it is hoped that the salt will be sufficiently washed out by the time the next crop is sown to allow the crop to mature.

It is interesting to see that some coconut trees planted on similar adjacent land reclaimed more than twenty years ago, are practically barren. The people say that, as soon as the roots reached the level of the salt tidal water, the trees ceased to grow properly. This confirms what I remember reading some years ago in an article on coconut cultivation, that it is the fresh seepage water from the land that keeps coconut trees growing on the sea-shore above; they will not grow well in pure salt water where there is no fresh-water moving in the sub-soil. On the other hand, land of this description, when reclaimed, grows paddy, followed by pulses in the second crop season.

21-219-15.

M. E. COUCHMAN.

* Samples of paddy and rice are kept in the College Museum. — Editor.

Agriculture in the Vizagapatam District.*

Vizagapatam is the largest district in India and the most thickly populated, as far as the coastal tracts are concerned, in this Presidency. Its people are strong, hardy and prolific, and its land presents a most interesting variety of conditions. Emigration is a most marked feature, however, and large numbers move yearly into the deltaic tracts of Godavari and Krishna, and across to Rangoon for work in the Burmese rice fields. Most of this emigration is due to a desire to evade the clutches of the money lenders, mainly Komatis and Marwaris who are the only agricultural bankers in this Presidency. Reference may be made to the District Manual for accredited instances of the most exorbitant rates. In one case a ryot 50 years ago borrowed Rs. 20. He paid back Rs. 50 in instalments, worked the whole of his life and died in harness. His son took on this debt and he too worked for the whole of his life, eventually dying in bondage and leaving two small sons whose services were also claimed for an alleged arrear of Rs. 3. Co-operative credit, could it become established, should do much to make such cases impossible.

The District may be roughly divided for agricultural purposes into 3 tracts:—

1. The strip of land along the coast consisting of a series of salt and sandy swamps.
2. The inland plains which drain into the Bay of Bengal by means of a series of rivers and jungle streams.
3. And the hilly tracts, the Agency, the most thinly populated in the Presidency.

The littoral tract is narrow and sandy and is agriculturally unimportant, except that salt pans, casuarina and coconut plantations are seen here and there.

* Summary of paper read at the last Agricultural Conference, by Mr. D. Balakrishna Marthi Pantulu, Farm Manager, Anakapalle.

It is the second division, the submontane plains, that is the most important and typical agriculturally and this paper refers mostly to the agriculture in those plains. These are made up of an undulating expanse of very fertile soil, mostly red but changing to black, in the basins of rivers and other alluvial spots and the Anakapalle Agricultural Station is fairly typical of a strip of alluvial land along the Sarada river.

Still more important is the Agency, but it is almost inaccessible, owing to the hilly nature of the country and the prevalence of malaria. The cultivation here is in the hands of hill tribes, the Sanaras, Koyas etc, and is therefore rude and primitive. The "Podu" cultivation is a clear instance of the rude and destructive nature of the cultivation practised. A strip of land is cleared and the cleared scrub is set fire to and the seed broadcasted in the ashes. After a crop or two are taken the land is abandoned and a fresh piece taken, cleared and treated similarly. In most of the Agency tracts weights and measures are still unknown, and the produce is disposed of in heaps and sometimes the grains are measured by baskets or pots and sold. The soil in the agency is most fertile and is not fully and properly cultivated, chiefly for want of labour. The hill produce that is coming to the plains is more a natural product produced without much effort and cultivation and this supplies more than three fourths of the trade in the district. The Raipur—Vizianagaram Railway is mainly intended to tap these rich Agency tracts and the line is now working up to Parvatipur and will improve matters to a very considerable extent when fully opened. The construction of the Vizagapatam harbour has the same object in view. The hill produce is brought down the hills on backs of cattle in big caravans and the whole is monopolised at ridiculously cheap prices by the few merchants of a few important places that are situated just at the entrance of the openings of the Agency into the plains.

Nearly 9/10 of the district is Zemindari for which no agricultural statistics are available. The area of the cultivated crops noted in the statistical returns are only for the tenth of the district which belongs to the Government for which regular cultivation accounts are maintained.

The rainfall in the district varies considerably. The average for the plains is 41 inches, the rainfall in the Agency tracts being 57 inches. This again varies very much with the elevation and aspect, from 75 inches to 44. In the Agency tracts generally, the S. W. Monsoon brings most of the rain; in the plains the rainfall is more evenly distributed, though the S. W. Monsoon is the more important.

Soils present an equal variety. The prevailing colour is red but black soils are found in the alluvials strips bordering the rivers. The Agricultural year is divided into three seasons, the *Punasa* or the early season, May to August, the period of the S. W. Monsoon, when the staple dry crops are cultivated in all classes of soils, the *Peddapunta*, the regular wet crop season, August to December and the *Payra*, the period from November to April. The *Punasa* crops are by far the most important as they comprise cumbu and ragi, the staple food of the mass of the people and a failure of the S. W. Monsoon is a serious calamity.

Implements. The wooden country plough is the only agricultural implement worth the name. Levelling board is also used to level the wet lands after puddling, and the garden and wet lands after the seed is sown and covered with the country plough. Lolla is the next implement of importance used for moving soil from higher to lower places. The picottah is the universal water lift, and mhote is almost unknown. The picottah consists of a whole palmyra partially hollowed out, the hollowed out stump of a palmyra used as the lever, and a bamboo and a big bucket being bound round with hoop iron.

Very high seed rates are used invariably with all the crops. Considerable thinning is done after the crops are growing, leaving still very thick crops. A very excessive seed rate is used for paddy. I may be permitted to quote a curious instance that happened in the Anakapalle farm last year. 20 acres of land were to be under paddy for which the previous ryots used to sow 400 Kunchams (1 Kuncham = $6\frac{1}{2}$ lbs) of seed at 20 Kunchams per acre, the local seed rate in the neighbourhood of Anakapalle. I sowed 70 Kunchams in the same seed bed prepared for 400 Kunchams. I was laughed at and three neighbouring cultivators went to the extreme of sowing special and extra seed beds with a view

to sell the seedlings to me at exorbitant rates, as they thought that I could not transplant the whole area of 20 acres with the seedlings I raised and that I should be put to the necessity of purchasing their seedlings at the time of transplanting. When the seed beds were half grown they began to feel their folly. I leave you to imagine their surprise when the Dy. Director of Agriculture offered the very same ryots seedlings to transplant about 2 acres after I completed the transplanting of 20 acres on the farm!

The chief sources of irrigation are the river channels, tanks and wells. They are better in the northern portion of the district, especially under the Nagavalli where rice is the principal food crop. In the central portionumbu and ragi are grown more, as the irrigation facilities become less secure and in the south gingelly and millets are the chief crops as the sources of irrigation are scanty and doubtful. In the Agency tracts the conditions are quite different. Land is fertile and plentiful and the rainfall is heavy and unfailing. Almost all the rivers are provided with anicuts and channels spring from them. Formerly they were all temporary dams but the present tendency is to replace them by masonry constructions by which the channels at the tail end of the rivers get little or no water in adverse seasons and generally after the rains cease. Tanks are very small, except a few with no regulators, the ryots getting water by cutting the embankments. As already stated 9/10 of the District is Zemindari and the irrigation sources are disgracefully neglected. There are no proper arrangements for the regular distribution of water but time does not permit me to detail this evil. There are few or no pukka wells in the district. The existing ones are simply big earthen pits with crumbling sides. Nowadays a few well-to-do ryots are trying to improve them by providing masonry wells.

As there is a very rapid fall in the district in the lay of the land, from the hills towards the coast, the district is very beautifully drained though no care is taken by the ryots regarding drainage.

A suitable waterlift that can lift water economically is to be tried and demonstrated. Even on very large holdings of well-to-do ryots,

picotta is the only means of lifting water. In an area of 40 acres acquired for the farm there used to be 16 wells worked with picottabs by 64 coolies costing about Rs. 12/ per day and irrigating hardly 2 acres of land on the whole. There is abundant supply of subsoil water and the lift is about 20 feet. By improving one well and working a centrifugal, with an oil engine, the whole farm can be irrigated. The cost of the engine will not exceed the value of land reclaimed by filling the useless wells and water can be lifted at a much cheaper cost. But it is too premature for me to detail on the subject till the work is started. The Archimedian Screw may prove very useful for low lifts.

A word about the improved implements and I am done. The soils are ideal to be worked with iron ploughs. Gallows, Turnwrest and other smaller ploughs are doing excellent work on the farm but the cost is rather prohibitive to be in the easy reach of the ordinary ryots. There are a good number of rich landlords who own good cattle and these can go in for them. Agricultural Co-operation, as is found in the Ceded Districts, is the only method to popularise these costly implements. Trials are also being made with Ceded Districts implements.

Agriculture and its Improvements.*

Introductory.

India has, from time immemorial, been a great agricultural country with its teeming millions dependant mostly on it. Agriculture is the basic industry of the country, the industry on which most of the other industries depend. We should always bear this fact in mind and foster both simultaneously. We should produce raw materials of our industries. Without the former the latter becomes handicapped. We must produce them in quantities enough for home consumption, and then export to foreign countries what we do not want at home. Our Indian ryot at his best is as good as, and in some respects

* Summary of paper read at the last Agricultural Conference by Mr. M. Ganga Razu Pantulu, Secretary, District Agricultural Association, Berhampore.

superior to, any other average ryot in the world. If sufficient stimulus is given I am quite confident he would not lag behind, only he may not be inclined to run any risk as he cannot afford to do so, but never would he hesitate to adopt any improvement if he is convinced that it is to his own advantage. That is my experience, not only as the Secretary of my District Agricultural Association, but also as a landholder dealing with a couple of hundred of ryots directly under me. The attitude which the Government have taken in creating an Agricultural Department in several parts of this vast country, is a sign of the interest which the Government evince in the welfare of the masses. I wish to deal with a few of the many activities of the Government in trying to bring about a change in the agricultural practices of our country.

Agricultural Associations.

Agriculture will certainly prosper if there be one or more properly organised Agricultural Associations in each Taluk, and if their members be real Agriculturists. The charge that is often laid at the door of our Agricultural Associations, is that the actual tillers of the soil are conspicuous by their absence. This is no doubt a serious defect which we should try to cure. We want the real ryot, who would follow easily the experiments conducted in several farms of this Presidency. A ryot who takes real interest should be allowed to become an honorary member. There must be some agency which would expound to him the labours of the Agricultural Department. It is the ryot that surely makes a good agriculturist. It is he who constitutes our national wealth. It is he who is the backbone of the country. We must have organisations which would disseminate knowledge and create sympathy and united action amongst those whose goal is the same. These associations, in conjunction with the Agricultural Department, should recommend to our ryot, a variety of crops, suited to particular conditions of climate and of irrigation facilities.

Agricultural Farms.

The starting of Agricultural Farms in each district will enable us to obtain an account of the agricultural conditions of each tract which

they represent which will be of great assistance in judging its requirements and possibilities. We shall have some useful data on which to consider the feasibility of introducing new crops and extending the cultivation of those which already exist. The Experimental Farm at Samalkota has been able successfully to replace the local canes by Red Mauritius, much to the pecuniary advantage of the Godavari ryot. It has demonstrated to him that the greatest defect in his method of cultivation is the want of attention to drainage. It also served as an eye-opener to the cane cultivators of Hospet whose crops are said to be the best in the Presidency. The Koilpati Agricultural Station has been introducing improvements into cotton cultivation. The Palur Agricultural Station has introduced many new varieties of groundnuts, which have now become acclimatised. The Manganallur Agricultural Station has shown to us how good treatment of the land improves the texture of the soil and thereby improves the natural drainage. It has taught us how successfully paddy can be grown with sunnhemp as a green manure crop. The starting of Agricultural Farms in each district would indeed play a prominent part in elevating the lot of that particular district. Those gentlemen who must have noticed the large interest taken by English landlords like Lord Willingdon, the Governor of Bombay, in farms, can easily see the imperative necessity of a farm for a whole district. We request the Agricultural Department to look to the consummation of this ideal.

Wells.

Water is required for absolutely necessary purposes throughout the year. Rains and floods cannot be available at all times in the year. Wells alone can afford the required aid, provided they are good and properly kept. When you are unable to advance the requisite funds, the Government are coming to our rescue, and advancing what are known as Takavi loans, which will become more and more popular if the rate of interest be accommodating. The Government have also given us encouragement and stimulus to take advances from them. The Land Improvement Loans Act, Section 11 provides that "when the land is improved with the aid of a loan granted under this Act, the

mere rise in value derived from the improvement shall not be taken into account in revising the assessment of Land Revenue. The poor cultivators of the soil would be wise if they sink small wells in their dry and wet lands. When rains fail and water in the rivers and in our canals goes down, the wells will no doubt stand in good stead and prove a substantial source of irrigation. Government have been pleased to organise a special staff for well-survey and well-boring. Any attempts to induce ryots to sink wells on a larger scale will be received with thankfulness by the well-wishers of the Indian ryot.

Elementary Education.

Elementary education should be spread more widely, provision being specially made for the teaching of agricultural science. In this country which is pre-eminently an agricultural one and where substance is mainly drawn from it, agriculture should be a subject of study in all the educational institutions. School gardens would be of immense use to our ryot population, as they inculcate industrious habits in them, and will enable them to introduce new food plants. It is the school gardens that would to some extent bring into contact the young mind with nature and evoke in him interest in the practical side of agriculture. It is nature study that develops in him the qualities of observation and reasoning. It is elementary education that is needed for the improvement of our agriculture.

Agricultural Instructors.

We want men trained in the various agricultural institutions to fill the chairs in our Universities, we want them for our research work and we want them as lecturers at the Agricultural College. We want men who can combine science and practice for practical demonstration. We want men who in the field can carry out any agricultural operation, men who can manage and repair any agricultural machinery, men who will run a dairy farm and turn out first class butter, men who can withstand any amount of hardship in the field and who know the reason for every agricultural operation that they carry on. We want men who can understand the livestock, and who will be helpful to their neighbours and their cattle. These are the men we want for

the upheaval of our Indian Agriculture. May this College produce them in greater numbers than it is now doing.

Agricultural Instruction and Co-operative Movement.

The Tropical Agriculturist gives an account of the marvellous interest which the Railway Companies take in the matter of agricultural improvements in the United States. We have no such organized system of seed farms from which supplies of pure and improved seeds can be obtained. We have to introduce improved varieties of seed to teach simple methods of preventing and remedying insect pests. We want facilities for supplementing the present supply of manures. Such organizations as these will enable the ryot to understand what implements would suit what soils and how best he can utilise them. Agricultural Banks that would extricate the impoverished ryot from the tight grip of our greedy sowcars should be established in every village. The passing of usury laws will be very much to the advantage of our ryot who would welcome them with all his heart.

Conclusion.

In this country, it is a pity that agriculture is regarded as a profession beneath the dignity of an educated man. If educated men return to their villages and engage in the propagation of scientific agriculture, certainly there will be a revival, for, their farms would serve as models for the imitation of their neighbours. You, young men, who have been pursuing agricultural knowledge in these halls, will, I hope, prove an exception. In you we confide; to you we look up as the saviours of our ryot population. You have chosen a profession which only the future generation will be able to appreciate. No doubt you are the essential factors to contribute to the successful progress of Indian Agriculture. In a country like ours where agriculture is the mainstay of the indigenous population, any efforts made by individuals or public departments for the amelioration of the condition of our ryot population by imparting to them scientific agricultural knowledge are most welcome.

Notes.

Making compost:—In the village of Eppothuvendran, a black soil dry village between Ettiyapuram and Tuticorin, I came across an excellent practice of making compost. There was a depression in the ground some distance from the village where silt from the adjoining lands accumulates in the rainy season. This silt was at the time of my visit being removed. It was still quite wet. A layer about 9" thick was spread on the ground in a neat rectangular area. On this, a layer of ordinary cattle manure about 4" thick was evenly spread. This was again covered with a layer of wet silt on which cattle manure was again spread. Alternate layers of silt and cattle manure were then built up. One compost stack which was being built was about 5 feet high. I enquired the reason why this system was adopted in preference to the usual system of keeping the cattle manure in a pit and periodically covering it with silt and was given the very sound explanation that there was no silt available near the village and as the manure was mixed with silt in the proportions of about one to three, this saved considerably in carting, especially as the manure was to be used in lands distant from the village.

H. C. SAMPSON.

The Agri-Horticultural Show held on 26th and 27th February in the Agri-Horticultural gardens at Madras must be considered a success so far as collection of gate money and the attendance of visitors are concerned. It is generally known in Madras as "The Flower Show." The horticultural side was a fair show, but the judges remarked that the economic section was not so fairly represented as it used to be in some of the previous years. Economic and Agricultural sections have, more or less, been side shows so far and, if what we read in the papers be partly true, it looks as though the side shows will be abolished unless a keener interest

is evinced in these both by the organising committee and the exhibitors. A specimen of a paddy plant which had tillered profusely as a result of single planting and the collection of Cambodia and Karunganni cotton were amongst the exhibits of the Madras Agricultural Department which were much appreciated.

The Sugarcane Harvester:—It has been said that the sugarcane industry is one of a rapidly diminishing few "in which the hand labour of a century ago has not been ruthlessly routed by science and superseded by tireless machinery." As a protest against this, *The Sugarcane Harvester* has arrived. It was invented by Mr. George D. Luce of New Orleans. It took him nearly 15 years to perfect this and "The Luce Sugarcane Harvester Company" at New Orleans are said to be hard at work turning out machines for the 1915 crop. It is said to be an all-the-year-round worker and, besides harvesting cane, it is capable of ploughing, cultivating, road making, grading etc. By an ingenious arrangement it harvests, tops and strips the cane. Canes which have tumbled down stand erect as the harvesting appliances approach the clump. Two men are required to operate the machine which will cut, top and strip from 150 to over 200 tons of cane per day. The machine is worked by a gasoline engine which drives the machine and also furnishes the requisite power for its working. Surely we are in a world of progress. T. S. V. (*From the Louisiana Planter*).

The doctrine of Telegony:—The principle of telegony is that, when a female is impregnated by a male to which she is bred, all her subsequent offspring, regardless of their actual male parents, will show influence of the first mate of the female. Telegony is well illustrated in the case of birds, especially pigeons and domestic fowls so that poultry keepers have to take care in the first mating of their young fowls. Superfetation that is, the possibility that females may be bred twice with an interval of some hours or days,

by two different males and produce offspring, some of which are due to the first male and some to the second, is often mistaken for telegony. Superfetation is common in dogs and other lower animals, so that one who aims at a pure breed of dogs should not allow his bitch to be crossed a second time by an inferior breed even a few days after it had been bred by a pure one. Several instances of supposed telegony have been noted in cattle, horses and other animals, but these might be due to atavism or superfetation. As the result of a series of experiments, conducted recently, the inference is drawn that telegony may be neglected in eugenics and stock-breeding. K. C. J. *From the Journal of Heredity.*

Sugar and diamond:—"A Missouri paper ventures the information that the day will come to pass when they will make diamonds out of sugar. The route of demonstration is the chemical one, as sugar contains carbon and diamonds are composed of carbon shuffled together molecularly. The paper claims that some real diamonds were produced but that they were destitute of any value commercially. Scientists, it is claimed, have often expressed the hope that an improvement in the process of manufacturing diamonds could be effected whereby the necessity of dissolving the carbon in molten iron may be dispensed with and the required combination of great pressure with great heat may be brought about by some such operation as squeezing the carbon between red-hot metals. If King Sugar goes on this new exploring expedition, we may hear some day the expression. "Acres of diamonds":—K. K. R.—*From the Louisiana Planter.*

The Students' Club.

Literary Section:—

Sir Narayan Chandavarkar's stay in Coimbatore was availed of to request him to deliver an address to the students of the

College, which he kindly did on 24th February 1915. The substance of the address was this:—

Recalling the days of his studentship in the Elphinstone College, Bombay, over 40 years ago, he wished he could join the Agricultural College now as a student. He had received only literary training and had been a bookworm, and probably a certain amount of such training is necessary to enable even agricultural students to idealise themselves. He again recalled the days when the late Mr. K. T. Telang objected to the affiliation of the Poona Agricultural College to the Bombay University on the score that he wanted that India should not remain an agricultural country, but all the same the motion was carried. The learned visitor said that no kind of reform would ever succeed in India, political, religious, social, moral or industrial, unless India's agriculture was greatly improved. Agriculture has been the basis of the Hindu Shastras and of Indian polity. An agriculturist's life was the best, as it was free from anxieties and the life from which others have to draw their lessons. The farmer is considered to belong to a lowly class, but innocence, purity and godliness are his traits. He gets up very early, toils through the routine and drudgery of life, does not complain, does not think of reputation and his one object in life is to do his work, trusting in God. There is a lot of wisdom to be learnt from peasants and, according to the Vishnu Purana and the Jew's Bible, Hari dwells among them. Sir Chandavarkar has the knack of drawing moral lessons from actual observations of men and things and his addresses are brimful of interesting anecdotes. On behalf of the students, the Principal tendered a hearty vote of thanks to the distinguished and learned visitor.

Games.

Hockey:—In continuation of the match won by us and reported in the last issue, three more matches were played with the

Coimbatore Gymkhana, and all of them were equally matched and some interesting and exciting game was witnessed. The first match was drawn, one goal each, the second was won by the Gymkhana, 2 goals to one and the third was won by us, 2 goals to nil. Evidently our players have justified the colours awarded to them.

Tennis:—The Tennis Tournament for the Cecil Wood cup was held in the first week of March. As many as 20 students, competed and the finals were played on 7th March 1915 between A, Jesudasan of Class III and K. Rangaswami Pillai of class I. Both were well matched and some exciting game was witnessed with the result that Rangaswami Pillai won the match. The results were 2—6; 6—2; 6—3. The Principal, in requesting Mrs. Harrison to present the cup to the winner, gave a history of the institution of the present cup by Mr. B. Dwaraknath who was himself the winner for three years in succession of the cup then instituted by Mr. Wood himself. After Mrs. Harrison presented the cup to the winner, a delightful evening came to a close with cheers to Mrs. Harrison for presenting the cup. We understand that a medal will also be presented to the winner and the runner-up.

A tennis match was played between the College and the Coimbatore Club on the new American system. There were 3 sets of players (doubles) on each side playing in 3 different courts, and each team had to play each of the opposite teams a match of 9 games, sides being changed every odd game. Each team therefore plays 27 games. Out of a total of 81 games played, the Coimbatore Club secured 50 games, while the College players could score only 31 games.

Departmental Notes.

1. Mr. S. Subbayya, Dip. Agri., Assistant Farm Manager, Central Division, to act as Farm Manager, 2nd grade, with effect from 1st February 1915.
2. Mr. P. S. Venkuswami Aiyar, L. Ag., appointed to act as Assistant Farm Manager and posted to Palur.

Estate.

During February, Mr. C. G. Leftwich, I. C. S., Director of Agriculture, C. P., and Mr. R. G. Allen, Principal of the Nagpur Agricultural College, visited the College and Farm, as also Sir Narayen G. Chandavarkar, retired High Court Judge of Bombay.

Mr. P. S. Ramaswami Aiyar, B. A., B. E. who was formerly Supervisor in the Department of Industries, is now the P. W. D. Officer in immediate charge of the buildings in the colony of the Agricultural College.

Owing to the institution of 2 courses at the College and the number of students having largely increased, additional accommodation will be provided in 4 new blocks, each of 10 rooms, to the west of the present blocks 7 to 10. The work is being rapidly pushed on and is expected to be completed long before the new admissions in June. The estimate is for Rs. 24,600 and the work is being done departmentally and not on contract.

The Headmaster, staff and students of the Government Training School, Coimbatore visited the college and were shown round the several sections by the staff. They played a Badminton match with the Officers' Club and were defeated by 2 games to nil.

Some Weeds of the Central Farm, Coimbatore.

(Continued.)

Umbelliferae.

Hydrocotyle asiatica, Linn. Vallarai Keerai. வல்லாரைக்கீரை

Rubiaceae.

Oldenlandia umbellata, Linn. Saya vair. சாயவீரர்

Oldenlandia aspera, DC.

Spermacoe hispida, Linn. Nathai churi. நத்தைச்சூரி

Compositae.

Vernonia cinerea, Less. Neichitti chedi. நெய்சிட்டிச் செடி

Vernonia anthelmintica, Willd. Kattu seeragam. காட்டு சீரகம்

Ageratum conyzoides, Linn.

Grangea maderaspatana, Poir. Masi patri? மாசிபத்திரி?

Erigeron asteroides, Roxb.

Blumea lacera, DC. var glandulosa, Kattu mullangi. காட்டுமுள்ளங்கி

Laggera aurita, Schultz.

Sphaeranthus indicus, Linn. Kottai karanthai or Vishnu karanthai. கொட்டைகாரத்தை or விஷ்ணுகாரத்தை

Vicoa auriculata, Cass. Mukkutti poondur. முக்குத்திப்பூண்டு

Xanthium Strumarium, Linn. Marul oomathan. மருள்ஊமத்தன்

Flaveria australasica, Hk.

Eclipta alba, Hassk. Karasaranganni. கரசாரங்கண்ணி

Blainvillea latifolia, DC.

Glossocardia linearifolia, Cass.

Tridax procumbens, Linn.

Volutarella divaricata, Bth.

Lactuca Heyneana, DC.

Sonchus asper, Vill.

Sonchus oleraceus, Linn.

Sonchus arvensis, Linn.

C. TADULINGAM.

(To be continued).

THE JOURNAL

OF

The Madras Agricultural Students' Union.

Vol. III.

April 1915.

No. 4.

The College Convocation.

The annual Convocation for the purpose of presenting Diplomas and Prizes was held on 30th March in the big Lecture Hall, the Director of Agriculture, Mr. D. T. Chadwick, I. C. S., presiding. Besides the staff, officers and students, a good number of prominent gentlemen of Coimbatore were present.

The Principal, reviewing the work of the College during the year in the various classes, said that it was a source of great satisfaction to him and to all of them that this year witnessed the largest number of Diplomas during the last 3 years and that all the students who presented themselves for the final Diploma Examinations came out successful, although it was a pity that student N. R. Srinivasachari had to be absent from the Examinations on account of illness. He further said that personally he was of opinion that,

although all the students passed, the quality was not quite so good as last year and warned the present students against presuming that it would be a mamool in future years to pass all who sat for the Examinations. He impressed upon the outgoing students the important fact that the Diploma was not an end in itself, but was only a step towards acquiring knowledge in practical life and hoped that the instruction they had received at this institution would stand them in good stead in the pioneer work which was awaiting them. He was glad to find that class II had done very well so far and was full of hope that they would put forth their full energy during their third and final year. As regards the new class I, it was very gratifying to learn that the Deputy Directors had reported very favourably about them, this being attributed to the increased amount of practical work done by the class in the field. He asked the students to remember that they owed a great deal to the Hostel Warden, Mr. Tadulingam Mudaliar, for all the comforts they have had.

On the games side, tennis and, more particularly, hockey were the all-absorbing games, the peculiar time table of the college not admitting of students of all classes assembling for cricket as often as in other colleges. One new tennis court had been laid with the help of Government, and he proposed to apply for sanction for an additional court. The Cecil Wood Tennis Cup, instituted by Mr. B. Dwarakanath, was won by K. Rangasami Pillai of class I. In hockey a number of matches were played during the year with outside teams in most of which the college won and colours have been awarded, for the first time, to the team.

The Principal, before requesting the Director of Agriculture to present the Diplomas, mentioned that it was in contemplation, at the request and suggestion of some parents of the students, to institute the system of private tuition or coaching for some of the backward students.

The Director of Agriculture then presented the Diplomas of Licentiate in Agriculture and the Prizes to the successful students:—

Manga Razu, K.	Sankunni Menon, K.
Manickam Mudaliar, V.	Sitaram Patrudu, S.
Muthayya Nattan, M.	Viraraghava Rao, M.
Narasinga Raja, C.	Viraswami, B.
Pranarthiharan, S.	Vittal Rao, U.
Ramaswami Aiyar, T. S.	Vyasrajan, C. P.
Sankarakumar, L.	Yesudasan, A.

Robertson Prize for Proficiency in Agriculture. Gold medal. S. Sitaram Patrudu.

Clogston Prize for General Proficiency, judged by class marks. Gold medal. M. Viraraghava Rao.

Keesa Prize for Proficiency in Agri. Chemistry. Gold medal. M. Viraraghava Rao.

Close associate for the Keesa Prize:—Books. Viraswami, B.

After presentation, the Director of Agriculture delivered the following address:—

MR. WOOD AND STUDENTS AT COIMBATORE:—

It is a great pleasure once more to come again to Coimbatore and, at the end of our College year, to wish good luck to another batch of students finishing their Agricultural course. And I understand that some of this year's students merit our congratulations in a peculiar sense. Some have done very well and those we congratulate wholeheartedly in the customary manner. It is, moreover, a matter of great

satisfaction to find some Telugu boys well to the top this year and I hope that Telugu lads in the other years will strive hard to maintain this relative position. But so I understand, never in any previous years have so many students avoided the dark abyss of failure by so narrow a margin. And whilst we wonder at these tactics and congratulate them upon their success, yet we cannot hold up their achievement as an example for succeeding years. We are all honestly glad that they have escaped the disappointment and humiliation of failure, but it is not sufficient in life to scrape through. Personal satisfaction in one's own work varies with the thoroughness and excellence with which it is done. The same two qualities in our work also determine the degree of confidence and respect we can command from others. And I hope that each succeeding batch of students at Coimbatore will see to it that they put the standard of work higher and higher and so stimulate the years that are to follow, to greater efforts.

It is not usual at this stage to refer to the doings of those who are still in their second year. But the second year deserves both a word of commendation and a word of warning. At some of the Diploma examinations which ordinarily come at the end of their second year, they have done exceedingly well—especially in Chemistry and especially in the practical examination. This is most satisfactory and promises well for the future, but they have still a year to go and I most sincerely trust that, during that year, they will not allow any wrong sense of security to weaken their efforts or lessen their strivings. Success in life rarely falls to those who make an occasional spirit and then relapse into

procrastination. We shall all be interested to watch how the present second year meets its coming tasks and I hope that we may not be disappointed.

Last year to the students that were then leaving the College, I endeavoured to give a short motto to aid them in their work in Agriculture, viz:—*Courage and Caution, caution to think out carefully their reasons for adopting any line of action and then courage to act and courage to defend it.* It is not sufficient to intend to do the right thing, it is above all things necessary to convert intentions into actions, and to see that the thing needed is done. Also it is, above all things, necessary for you who go out, to apply new ideas to practical farming, that you have thought out your reasons for the advice you give and are prepared and ready to defend it with good reasons. Nothing gives me greater pride in this our College or fills me with greater hope for its future than to hear our students described as *courteous, respectful, able to speak out*, ready to give the reasons for what they think, not weathercocks blown about by any assertion. To this year also I would try to give a short motto which I would ask them to remember, viz:—*Farmers first.*

Agriculture is the most ancient and most honourable of the world's callings. Lawyers, priests and schoolmasters, traders, inventors and engineers only appear in a State's history after a start has been made in agriculture. It is above all things honourable to apply trained common sense to increasing the productivity of the earth on which ultimately all human activities depend. And that is what

scientific agriculture is. It is no abstract science, no figment of the imagination woven by sedentary philosophers, it is the application of knowledge and trained common sense to practical farming. And I hope that all who leave these halls will determine to be farmers first, farmers always. Some of you will, I trust, join our Agricultural Department, but if you do, whilst you must most scrupulously carry out your duty to your employer, the Government, yet still I want you to be farmers first, Government officials second. The success you will win in the Agricultural Department depends upon the influence you can gain with the ryots. It is not for an Agricultural Department to order or to punish, but to persuade and influence. This you will never be able to do unless, from the very beginning of your career, you make it your first object to cultivate friendly relations with the ryot. Unless you can do so, you are useless as far as this Department is concerned. And you can never gain the ryots' confidence unless, by your method of life, you interest farmers. So whether you go back to your own land or whether you enter the Department, I trust you will ever be "farmers first." And, as such remember that there is nothing connected with land or crops or cattle which is not of direct interest to you. Our Farm Managers and our Assistant Farm Managers are the eyes and the ears of the Department. They have smaller charges and can spend more time in the villages than can the Deputy Directors or the Principal. And, although you may have been sent out for some particular duty, remember that anything of farming interest is of importance and interest to them and to you.

In other words, be farmers first, not only subordinates carrying out some orders.

There is only one other thing I would wish now to speak of and that is to ask you to stick to the Madras Agricultural Students' Union. Support it as well as you can, help the journal. The Union is doing excellently. But, although it may not seem much to you at present, yet, believe me that, when the time comes for you, as it comes to all, to tread the dustier, hotter stretches of middle age, it is a help and an encouragement to know that, in your old College, among your old fellow students, there is always a warm welcome for you and one which, if you have helped and supported the Students' Union, is doubly deserved. And the bonds of union among you will bind you tighter and tighter, the more clearly you all keep before you the ideal of farmers first.

To those that are now leaving we wish all success. To those who are to return we wish a happy holiday. (*Loud applause*).

Reflections on the Life of a Student at Pusa.

Pusa is a small Agricultural colony in the newly constituted Province of Bihar and Orissa. It stands on the banks of the river, the little Gandak. It is quite close to Janakapur, an ancient sacred place, near Darbhanga. And it is about 6 miles off from Waini, a Ry. Station on the Bengal and North Western Ry. To a man of Southern India, the shortest cut and the most economical one is to reach Calcutta by train; then to get into the Mokameh Express at about 9.30 p. m., so as to reach Mokameh Ghat, on the Ganges at

about 6, the next morning. Here the holy waters of the Ganges should be crossed by a steamer. This takes an hour. And on the other side the train waits to carry passengers to Waini within a period of 3½ hours. Unless due intimation is given, it is not possible to get farm carts other than the North Indian ekkas, the worst type of which is available at Waini. It may be said that it is highly difficult for one ignorant of Hindustani to travel in N. India; much more is it in the Province of Bihar and Orissa where the masses are the least educated.

As a person proceeds from Waini to Pusa, a few miles off from the village, are found clusters of bamboo, the resort of jackals; and, on either side of tidy roads of gravel, there are teak and other trees of luxuriant foliage. Just behind these is seen the Phipp's laboratory, one of the grandest scientific institutions of India. This is due to the generosity of Mr. Henry Phipps who placed at the disposal of Lord Curzon a donation of £ 30,000 for scientific research. A major portion of this was devoted to the Agricultural Research Institute at Pusa and the rest to the Pasteur Institute at Coonoor. The building presents a fine aspect. Its walls are massive; it has a dome in the centre surrounded by small ones. And the whole is characterised by unity, beauty and grandeur. Here are seen various laboratories intended for chemical, bacteriological, mycological, entomological and botanical research connected with agriculture. This building stands magnificent in the farm of 1300 acres. A portion of it is arable; and the rest is pasture and waste land. The soil is of a sandy, alluvial nature, containing a large percentage of lime. The fields command good drainage. The climate has its own peculiarities. A southerner feels the extremes of temperatures, the scorching sun in May and June and a biting cold in November and December. But a Punjabee feels this quite pleasant, since his place is much worse than this. The rainfall is, on the whole, 50" to 60" from both the monsoons, a greater part of it being derived from the south-west. The crops generally raised are cholam, maize, wheat, barley, oats, sugar-cane, castor, dholl, guinea-grass, mulberry etc.

So much for the place. As for study, it depends upon the taste of the individual who goes to Pusa. The instruction imparted in the

Imperial Agricultural College is not of a general sort; but it is of a special kind, as opposed to that in a Provincial Agricultural College. A student is allowed to specialize in one particular branch of study; and the time required varies with the subject chosen, from a month to two years. There are, what are called, the short courses, as apiculture lac-culture, gardening and cattle-breeding which do not last longer than 1½ to 3 months. Sericulture is from 6 months to 1 year; by dint of perseverance, it is possible for one to learn both eri and mulberry methods of cultivating silk. Poultry farming, practised a few years ago, has now been given up. And there is every prospect of a dairy farm being opened in the near future. A knowledge of English is not necessary for these courses, since instruction is also given in Hindi. On the other hand, there are subjects like Agricultural Chemistry, Botany, Mycology, Entomology, Bacteriology and Agriculture which require a sound knowledge of English. Admission is given to University graduates or distinguished Provincial Agricultural graduates. Here it might be mentioned that Pathological Entomology, a branch of the Institute professes to teach "Stygomia", to graduates in medicine.

The management of each branch of study vests mostly in the hands of European Scientific experts, who are aided in their research by trained Indians. And all these are under the control of the Director who is the Principal of the College and also the Agricultural Adviser to the Government of India.

The college hours are generally from 6 A. M. to 12 noon during summer and 10 A. M. to 4 P. M. in winter. It is really pleasant to work during winter, since the climate is embracing, but very trying and troublesome to pull on in summer in spite of electric fans. Botany and Agriculture have their own hours of study, generally from sunrise to sunset, with a recess of about 2 hrs. at midday. And it is possible to work during off-hours with the consent of the Professor in charge of the subject, if a student shows special aptitude for it. The Laboratories are very well equipped with up-to-date scientific apparatus; and a man of a scientific turn of mind finds it happy to concentrate his attention on a subject in these halls of learning. Generally, more attention is bestowed on the practical aspect of a

subject, though the theoretical side is not forgotten. Attached to each laboratory, there is a small library, apart from the general library. It is not easy for a student to find time and get admission into the general library. But when one finds a way into it, he is much delighted to find newspapers, leaflets, bulletins, journals, and magazines etc, circulated from different parts of the world. These provide the student with a fund of useful and valuable information. These also give a comparative idea of the backwardness of our Indian Scientific Agriculture.

As for accomodation, there is the Hostel, intended for 70 students. Apart from its dreary, gloomy look, owing to scantiness of students, it stands towards one corner of the colony. But its loneliness is greatly relieved by the construction of a High School for boys. Students experience much difficulty in the question of mess. Each has to look to his own arrangements. To live alone and unfriended in the case of a Brahman costs Rs. 20-25 per mensem; but, when joined with others, it costs less i. e, about Rs 15 to 18. Non-Brahmans can get on with Rs. 12 to 15 a month. This includes the cost of milk which is cheap, but excludes that of washerman, barber etc. There is no room rent; and even education is imparted free. In short, a southerner can get on decently with Rs. 300 per annum, including the Ry. expenses to and fro. (May and June are vacation months, while Durga Puja and X'mas contribute a month for enjoyment.)

There are two Clubs. One of them is solely for Europeans; and the other is for the Indian staff and students. The latter gets some help in the supply of newspapers and magazines from the Govt. Games, such as Badminton, Tennis, Hockey, Football and Cricket are maintained partly with the help of Europeans. On the whole, excepting the first three, there is not much activity shown in the rest. But in winter the "maidan", kept green at an enormous cost, looks gay and lively. Polo is confined to the European public. Tennis is played on lawns. Players, few in number, take a keener interest in Hockey than in Football and Cricket. Football is the national game of Bengal; while Hockey is in its full swing in other parts of N. India. One salient feature of the Social Club, especially, is that there is scope for people from

different parts of India to come in contact with one another; and all differences of status are sunk there. Students, who are generally graduates, move on a par with others.

Besides these, there is the Pusa Students' Union, started by a handful of post-graduate students in the year 1912. Its object is to discuss literary, social and scientific matters. The Union receives cordial help both from the Govt. and the public of Pusa. Within the estate, there is a Post and Telegraph Office; and the Hospital is a great boon not only to the Pusa public, but also to the surrounding villagers.

Such in brief is the life of a student at Pusa. But the place would have been more attractive if it had been on the main line between Calcutta and Delhi; and the Institute would have attracted more students, especially for post-graduate study, if there had been a University Degree or a Government title, as M. Sc. or M. Ag.; and prospects of post-graduates are far from encouraging. After all, during a short stay of 2 years, a students' life at Pusa is happy and pleasant. There is wide scope to study different characters, since all nationalities are there. Necessarily, one grows wiser on his final return from Pusa than when he goes there in the beginning. But, as a bit of advice, one must move cautious.

B. DWARKANATH, L. AG.,
Post Graduate, Pusa.

Some Difficulties in the Way of Extending Sugarcane Cultivation. *

Although it is well known that sugarcane planting is very profitable, the difficulties attending the cultivation of the cane and the harvesting and manufacturing of it into sugar or jaggery, deter many from undertaking it on an extensive scale. A large quantity of water

*Being summary of paper submitted to the Agricultural Conference held on 20th July 1914, by Mr. N. Krishna Aiyangar, B. A., Landlord, Mysore.

is required to grow cane to perfection, but stagnant water is detrimental to its growth. As most of the irrigated holdings are so situated that it would not be possible to drain them without cutting a drain across other holdings, a very large area of good land is found unfit for cane planting. Further a large area of land that admits of being easily drained is often found unsuited for cane growing on account of the capacity of the irrigating sources being insufficient. This difficulty could be, to a great extent, overcome by the better conservation of water and also by supplementing the sources of water supply by lift irrigation.

Sugarcane being a gross feeder, a large quantity of manure is needed for its successful cultivation. Many give up planting on account of the difficulty of procuring manure which is every day getting dearer. The chief difficulty, however, in extensive and intensive cane culture is that attending its harvest and manufacture. The sugarcane crop, after being at its best for a short time, at a certain age rapidly deteriorates or the sucrose content is reduced. To avoid this loss of sugar, the cane has to be cut as soon as it is ripe, milled as soon as it is cut and the juice boiled as soon as the cane is crushed. All these operations have to take place simultaneously. In consequence a number of people and cattle have to work at one and the same time. As few can command the labour and cattle power required for the purpose, sugarcane is generally harvested (1) by a few growers clubbing together or (2) by letting it out on contract to professional mill-men. Cane growers who arrange to harvest their crop by clubbing together are unable to plant on an extensive scale on account of some practical difficulties of the system. Under the contract system the professional mill-men go from village to village working with a mill, pans and a few pairs of buffaloes. The mill generally is out of repair. The number of buffaloes they can afford to keep is usually small. Consequently they take a long time to get through the milling of a small plot of cane. The grower, for want of a better agency, has to be content with their indifferent work. The result is that a small quantity of jaggery per acre is turned out owing to the deterioration of cane and the defective crushing and boiling. If, on the

other hand, the cane is cut quick and as soon as it is ripe, the grower not only gets a larger quantity of jaggery per acre but has also the land, occupied by the cane, available for other crops.

To this end, should there be factories to work up large quantities of ripe cane, the cultivator, not being hampered with the difficulty of harvest, would be able to extend his cultivation. It is generally admitted that the average system of cultivation adopted and the quality of the cane grown in South India are good. This being the case, it is to the best interests of the grower to dispose of it in a quarter where the maximum amount of sugar, which has cost him so much labour and skill to produce, is extracted in the most marketable form rather than allow it to be sacrificed by imperfect methods of manufacture. The large central factory system has, to some extent, been tried in India and not proved successful.

This does not disprove the general principle involved but merely indicates that the country is not ripe for such radical development. It is too long a jump from the cattle mill to the large central factory. Centralization on the theoretical scale means an upheaval of long standing conditions and traditions which, even with the best organisation and control, would inevitably result in failure. The position requires therefore to be approached cautiously and, from the point of view of present experience, keeping, however, in view the principle of centralization, the question resolves into the consideration of what should be devised to best meet the immediate requirements. Although large central factories are by far the most economical, yet for the reasons stated, the erection of small factories—I do not mean factories of the sort started at Singanallur—to make jaggery appears to be more suited to the present circumstances. A major portion of the losses, due to defective crushing and inversion in evaporation, could then with advantage be avoided. The value of the jaggery obtained by better crushing and evaporation will, I am convinced, enable the factory to pay its initial cost in a few years.

The failures of a few who put up machinery for various purposes, the difficulty of getting timely professional advice and help and the

risk involved in importing machinery, the first of its kind, deter many from investing in machinery. If Government should put up a small factory for demonstrating the advantages to be derived by the use of machinery in jaggery making, the above mentioned difficulties would, I think, be solved to a very great extent. I am fully aware of the disadvantages of Government undertaking a work of the nature. Under Government control, the working charges of the factory will surely be high, making the net advantage appear very slight over that derived from the ordinary method. The main feature that has to be kept in view appears to be to conduct the experiment on lines which would ensure success in the undertaking. Success in the working should be ensured, as otherwise the effects on the industry at the very commencement would be disastrous.

"Anaikombu" in Paddy.—A Rejoinder.

The short note on "a new rice pest" contributed by Mr. K. Sankar is really of great interest to an Economic Entomologist. Although the Entomological Section of the Agricultural College and Research Institute, Coimbatore, was well acquainted with the existence of the disease known as "Anaikombu" or "Thandeethu" in the Tamil and as "Kodu" in the Telugu districts, its exact cause was, on account of the want of plentiful genuine material, but imperfectly known. The Entomological section is certainly very much indebted to Mr. Sankar for the fine specimens of attacked plants he sent by post and for the interesting account he furnished of his personal observations in the field. Original observations of this kind are extremely valuable and will, I am sure, be eagerly welcomed by the Editor. There are, however, certain inaccuracies in the description of the pest which may be brought to the notice of the readers of this journal. Our knowledge of the life history of this pest, I confess, is not yet complete; yet sufficient details have been

gathered from a thorough examination of diseased plants to enable one to grasp the broad outlines.

The small pinkish fly—very much like a mosquito in appearance—that is the true cause of the "silver shoots" in paddy is one of the gall-making flies, scientifically called the *Cecidomyiidae*. It was actually reared out from affected plants in the Insectary. Tiny young maggots of this fly were found in the interior of tender shoots feeding on the succulent tissues of the growing tip. It is not known where the eggs are laid and how the maggots reach the tissues of the young shoots. The destruction of the growing tip seems to result in checking the normal growth of the shoot and in inducing the abnormal development of one of the internodes of the stalk so as to form the elongate hollow tube, known as "Anaikombu." These "silver shoots" are thus in fact only galls of a peculiar kind. The small, thickset, pinkish maggot is usually found at the lower end of the hollow shoot. When full grown, it turns into a bright pink naked pupa within the hollow "tusk." The pupa has the rudiments of the eyes, wings and legs clearly sculptured out and possesses at the head end a set of 4 spines which enable it to bore its way out of the gall when the fly is ready to emerge.

Two Chalcid wasps are parasitic on this pest in the field, of which only one, the small black chalcid mentioned by the writer, is really important. This wasp seems to be able somehow to lay its eggs on the maggot inside the gall from outside. The grubs hatching from the eggs feed on the tissues of the maggot until at last only the thin skin is left. When mature, they construct tiny silken cocoons packed close together within the empty skin of the maggot, from which later on the wasps emerge and make their escape by biting a little hole at the top of the hollow shoot.

I trust, the reader will now be in a position to see where Mr. Sankar has gone wrong. It is evident he has mistaken the

bloated body of the maggot filled with the tiny parasite cocoons for the pupal case and has not recognised the true pupa which is naked and unprotected by any cocoon. His theory about "the vital organs of the parasitised maggot being reserved till the pupal case is finished" would seem to be quite unnecessary. Again the small holes noted by him at the top of the silver shoot are made not by the fly but by the small chalcid parasites.

Mr. Sankar further states that "the fly lays eggs singly on plants." So far the eggs of this fly have not been observed by anyone in India and, in case he had actually noticed them, he would be actively helping the progress of Science if he would let the Entomological Section know where they are laid and what they look like. If he will, during the next outbreak of this pest, send specimens of the eggs preserved in spirit, they will be thankfully received.

Y. RAMACHANDRA RAO,

Second Assistant to the Government Entomologist.

Honorary Visitors.

We print below the names of 17 Honorary Visitors to the College, recently appointed by Government for a term of 3 years. Only four of these have been Honorary Visitors before and we hope that the newly appointed gentlemen will visit the College much oftener than several of their predecessors. Honorary Visitors are a non-official, influential body of landlords and they can, on one hand, give the benefit of their actual experiences of life to the College authorities lest the latter become too academic and, on the other hand, benefit themselves to a certain extent by a direct observation of what is being done here and benefit the country at large by dispersing the ideas gathered here over a

large extent of their estates. In illustration of our remark, we would say that those who came here once have felt the longing to come here several times and, on each succeeding visit, seemed to have been gratified and even profited with what they saw. Those who never came—and they were the majority—cannot apparently know the nature of the work carried on at this important institution. In the name of the Madras Agricultural Students' Union, we would welcome them all to this Estate, at one time or other, especially at the time of the College Day and the Conference which are coming off in the middle of July. The names are:—

1. M. R. Ry., Rao Sahib M. Abraham Pandithar Avergal,
Tanjore.
 2. „ Rao Bahadur C. Hanumanta Gowd Garu,
Hospet, Bellary.
 3. „ V. K. Krishnan Nayanar Avergal, Kuttoor,
N. Malabar.
 4. „ R. Sivarama Aiyar Avergal, Ravanasamudram,
Tinnevely.
 5. „ Rajah Vasudeva Rajah Avergal, Kollengode.
 6. The Hon'ble Mr. P. Ramarayaningar, Kalahasti, Chittoor.
 7. „ „ E. F. Barber, Ootacamund.
 8. The Raja of Ettiyapuram.
 9. The Zemindar of Parlakimedi.
 10. The Zemindar of Telaprolu.
 11. T. H. Barry Esq., Cocanada.
 12. O. Dodsworth Esq., Kallikota, Ganjam.
 13. J. C. H. Fowler Esq., I. C. S., Vizianagaram.
 14. W. Neilson Esq., Nellikuppam, S. Arcot.
 15. A Steel Esq., Tuticorin.
 16. E. S. B. Stevenson Esq., C. I. E., Salem.
 17. Tothill Esq., Lovedale, Nilgiris.
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Diploma Examinations, March 1915.**PART I.**

1. **Agricultural Chemistry.** *Examiners.* { Mr. H. E. Annett.
 „ W. H. Harrison.
- First class.*

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| 1. Ramanathan, V. | 5. Gopalakrishnayya, A. |
| 2. Narasimhachari, L. | 6. Srinivasan, C. R. |
| 3. Gopalan Nayar, A. | 7. Jacob, K. M. |
| 4. Swami Rao, R. | 8. Kunhappa Nambyar, E. K. |

Second class.

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|-----------------------------|------------------------|
| 9. Balakrishnan, M. A. | 14. Jivan Das, R. |
| 10. Sankaran Pillai, K. S. | 15. Subba Rao, K. |
| 11. Duraiswami Aiyangar, G. | 16. Vridhachalam, U. |
| 12. Adinarayana Rao, K. | 17. Yesudasan, A. |
| 13. Shinappa Tolar, B. | 18. Sanjiva Rao, K. N. |

PART II.

- I. **Agriculture.** *Examiners.* { Mr. G. Evans.
 „ R. C. Wood.

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|------------------------|---------------------------|
| 1. Sitaram Patrudu, S. | 8. Viraswami, B. |
| 2. Vittal Rao, U. | 9. Ramaswami Aiyar, T. S. |
| 3. Narasinga Raju, C. | 10. Sankunni Menon, K. P. |
| 4. Viraraghava Rao, M. | 11. Yesudasan, A. |
| 5. Manga Razu, K. | 12. Muthayya Nattan, M. |
| 6. Pranatartiharan, S. | 13. Vyasrajan, C. P. |
| 7. Sankarakumar, L. | 14. Manickam Mudaliar, V. |

- II. **Veterinary Science.** *Examiners.* { Mr. D. Aitchison.
 „ S. L. D'Silva.

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|--------------------------|----------------------------|
| 1. Yesudasan, A. | 8. Sitaram Patrudu, S. |
| 2. Viraraghava Rao, M. | 9. Viraswami, B. |
| 3. Vittal Rao, U. | 10. Pranatartiharan, S. |
| 4. Narasinga Raju, C. | 11. Muthayya Nattan, M. |
| 5. Vyasrajan, C. P. | 12. Sankarakumar, L. |
| 6. Manickam Mudaliar, V. | 13. Manga Razu, K. |
| 7. Sankunni Menon, K. P. | 14. Ramaswami Aiyar, T. S. |

- III. **Agricultural Engineering.** *Examiners.* { Mr. J. Narayana-
 „ A. K. Subra-
 mania Aiyar.

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|--------------------------|---------------------------|
| 1. Viraraghava Rao, M. | 8. Ramaswami Aiyar, T. S. |
| 2. Viraswami, B. | 9. Sitaram Patrudu, S. |
| 3. Vittal Rao, U. | 10. Sankarakumar, L. |
| 4. Manickam Mudaliar, V. | 11. Muthayya Nattan, M. |
| 5. Pranatartiharan, S. | 12. Sankunni Menon, K. P. |
| 6. Narasinga Raju, C. | 13. Manga Razu, K. |
| 7. Yesudasan, A. | 14. Vyasrajan, C. P. |

Licentiates in Agriculture, 1915.

(arranged in order of merit as judged by the marks obtained in Part II of the Diploma).

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| 1. Viraraghava Rao, M. | 8. Manickam Mudaliar, V. |
| 2. Vittal Rao, U. | 9. Sankarakumar, L. |
| 3. Narasinga Raju, C. | 10. Manga Razu, K. |
| 4. Sitaram Patrudu, S. | 11. Sankunni Menon, K. P. |
| 5. Pranatartiharan, S. | 12. Ramaswami Aiyar, T. S. |
| 6. Viraswami, B. | 13. Muthayya Nattan, M. |
| 7. Yesudasan, A. | 14. Vyasrajan, C. P. |

Notes.

His Excellency the Governor, in the course of his tour in the South Arcot District, visited the Palur Agricultural Station and was shown round by the Deputy Director of Agriculture and the Farm staff. His Excellency appears to have been well impressed with the work of the district farm.

The Budget meeting of the Madras Legislative Council held in March is of great interest to agriculturists in general and of this Department in particular. More than a decade ago, it was not

uncommon that non-official members, apparently dissatisfied with the working of the Saidapet College with its dual control, were content with making interpellations about its apparent failure. Now we see that non-official members vie with one another in asking for more grant for the Agricultural Department, and the budget allotment has been increased by 1·2 lakhs, while retrenchment has been the rule in most other Departments on account of the war. The Government members are prepared to take the initiative of their own accord but, when the co-operation of the non-official members is assured, the scheme of agricultural advancement is not likely to starve for funds. They ask for more District Agricultural stations, for cattle breeding farms and manure factories. The first will, we understand, be gradually started as soon as more trained men are available and the second is already engaging the attention of the Department, but we are not sure whether manure factories of the kind advocated by the Hon'ble Mr. M. Ramachandra Rao are necessary. There are 3 or 4 European firms who manufacture manures which are more used by the planters who understand their value and have faith in their use than by the ryots proper. Some of these firms are now selling manures to the ryots also with the help of their own agents. What is really wanted is the opening of a number of Manure Depots in different tracts which might be popularised with the help of the Departmental officers. When the cultivators understand the necessity for special fertilisers, we dare say that Indian firms will spring up for manufacturing manures, if that is the Hon'ble member's intention.—*Editor*.

A correction:—Our note in the January issue that there was a dearth of Agricultural students in the Cawnpore College so as to necessitate the institution of scholarships to attract suitable candidates for admission was based on a misapprehension. We have now the authority of the Principal of that College for announcing that there is no dearth of suitable candidates, even with a notice of only 2 months of the new courses. We regret very much that we have unconsciously been led into error and beg to congratulate the United Provinces Department of Agriculture that the benefits of higher agricultural

education are being so warmly appreciated, for its own sake, over a greater portion of this agricultural country.—*Editor*.

We are glad to hear that Mr. T. V. Srinivasacharlu is doing very good work as Agricultural Instructor to the younger convicts of the District Jail, Tanjore. The idea of teaching agriculture to convicts originated apparently with the Superintendent of the Tanjore Jail and, from the successful experience at Tanjore, it is not unlikely that agricultural training may be introduced into other jails.

The Students' Club.

During the month of March, three very interesting lectures were delivered under the auspices of the Club. The first was by Mr. W. H. Harrison, Govt. Agricultural Chemist, on "Soil Gases evolved in paddy soils," a research work on which he and Mr. P. A. Subramania Aiyar have been engaged for some years and the results of which have been published by them in the *Memoris of the Department of Agriculture in India, Chemical series*. The second was by Mr. J. Chelvaranga Raju, on "Coimbatore Agriculture, past and present" in which he contrasted the agricultural methods and practices, as they existed in Dr. Buchanan's time in the early years of the last century, and as depicted by Mr. W. R. Robertson in his report and in Mr. (now Sir) F. A. Nicholson's *Coimbatore District Manual*, about 40 years ago, with the practices obtaining at the present day and showed the gradual changes that were coming on. The third lecture was given by Mr. M. R. Ramaswami Sivan on "the Geology of Southern India," which he treated from an agricultural standpoint, with the help of maps, charts and geological specimens. All the three lectures were well attended. Mr. R. C. Wood, Principal, who presided at Mr. Raju's lecture, predicted that, in the beginning of the 21st century, the chief power for agricultural work of all kinds would be electricity. Rai Bahadur K. Rangachari presided at the last lecture and, after complimenting Mr. Sivan for the lucid manner in which he treated the subject, said that Geology was a fascinating subject and hoped that some

of the students who had a good knowledge of Chemistry would take seriously to Geological studies in after life.

The election of office bearers of the Students' Club for the next session was attended with greater enthusiasm than usual, on account of the names of the Captains and Secretaries being engraved in the Honour Boards. The following were elected:—

President:— Principal (ex-officio).

Captain:— K. Rangaswami Pillai.

Secretary (literary):— E. K. Kunhappa Nambyar.

Secretary (games):— K. N. Sanjiva Rao.

Class III. representative:— R. Swami Rao.

„ II. „ „ :— C. Kuppuswami Aiyangar.

We have been asked to state that it has been decided to allow private tuition in special subjects, the coaching to be undertaken by Assistants not directly engaged in teaching who will be allowed to accept fees up to a limit of Rs. 100 per term. Applications are to be made to the Principal before the beginning of the next term.

Estate.

After the presentation of the Diplomas was over, a group photograph was taken of the staff and the new Licentiates. The Students' Club had organised a social gathering in the hostel quadrangle and the enjoyable function closed with the lighting of the bon fire on the maidan.

Dinners, social gatherings and garden parties were given, in honour of the new graduates, on the estate in the last week of March. At the social gathering organised by the Committee of the Students' Union, business was combined with pleasure. Medals which had been announced at the last College Day were now presented by the Vice-President to the amateur actors who made the Students' Entertainment a great success at the time. Every

one of the new graduates spoke freely of the circumstances under which he joined the College, of the pleasant recollections he was carrying home from the College and of what he intended to do. The members of the staff, in their turn, gave them a few bits of advice and asked for their co-operation in the successful working of the Students' Union and the Journal.

Departmental Notes.

APPOINTMENTS:—

1. Mr. R. Rogers Thomas, B. Sc., Probationary Deputy Director of Agriculture, to be Deputy Director, Central Division, as a temporary measure.

2. Mr. K. Unni Krishna Menon, Dip. Agr., Farm Manager, 2nd grade, to be Additional Teaching Assistant.

3. Mr. N. V. Viswanatha Aiyar, L. Ag., to be *Sub protem* Assistant Farm Manager, vice Mr. K. Ramanatha Aiyar, Dip. Agr., *Sub protem* Farm Manager, 2nd grade.

4. Mr. P. S. Venkuswami Aiyar, L. Ag., to be *Sub protem* Assistant Farm Manager, vice Mr. T. S. Venkataraman on other duty at the Sugarcane Station.

5. Mr. M. U. Vellodi, L. Ag., to be *sub protem* Assistant Farm Manager vice Mr. W. Raghavachari, Dip. Agr., *Sub protem* Farm Manager, 2nd grade; and he is posted to Koilpatti.

TRANSFERS:—

1. Mr. T. V. Rajagopalachari, Dip. Agri., Farm Manager, from Nandyal to Hagari.

2. Mr. K. Narayana Aiyangar, Dip. Agri., Farm Manager, from Hagari to Sirvel.

3. Mr. V. Dhanakoti Raju, Dip. Agri., Farm Manager, from Sirvel to Nandyal.

4. Mr. M. K. Nambyar, L. Ag., Assistant Farm Manager, to work under the Government Mycologist in the operations against Mahali disease in S. Malabar.

5. Mr. S. Narayaniah, L. Ag., Assistant Farm Manager, from Coimbatore to Palur.

6. Mr. P. S. Venkuswami Aiyar, L. Ag., Assistant Farm Manager, from Palur to Coimbatore.

7. Mr. K. Raghavachari, L. Ag., Fieldman, Govt. Lect. Botanist's section, to be Assistant Farm Manager, Coimbatore temporarily.

8. Mr. K. T. Bhandary, L. Ag., Assistant Farm Manager, from Coimbatore to Taliparamba.

LEAVE:—

1. Mr. K. Unni Krishna Menon—priv. leave for 6 weeks, from 1st April.
2. Mr. K. T. Bhandary—priv. leave for 6 weeks, from 15th April.
3. Mr. A. K. Subramania Aiyar, Engineering Assistant, priv. leave for 8 weeks from 7th April.

SERVICES LENT:—

Mr. T. Budhavidheya Rao, L. Ag., Assistant Farm Manager, Samalkota—Services lent to the Zemindar of Parlakimedi for 5 years for employment as Farm Manager, Parlakimedi, under Articles 762 (note) and 763 of C. S. R.

Some Weeds of the Central Farm, Coimbatore.

(Continued.)

Campanulaceae.		
Lobelia trigona, Roxb.		
Plumbagineae.		
Plumbago zeylanica, Linn.	Kodi veli or	கொடி வேலி or
	Chitra moolam.	சித்திர மூலம்.
Apocynaceae.		
Vinca pusilla, Murr.	Milagai poondu.	மிளகாய்ப்பூண்டு
Asclepiadeae.		
Calotropis gigantea, Br.	Erukham.	எருக்கம்.
Pentatropis microphylla,	Oopilan kodi.	உப்பிலான்
W & A.		கொடி.
Daemia extensa, Br.	Oothamani.	உத்தாமணி.
Tylophora asthmatica,	Nanjarappan.	நஞ்சரப்பான்.
W & A.		
Borragineae.		
Coldenia procumbens, Linn.	Seruppadi.	செருப்படி.
Heliotropium supium, Linn.		
Heliotropium ovalifolium, Forsk.		
Trichodesma indicum, Br.	Kazhnthai	கழுதைதும்பை
	thumbai or	or கவிழ்தும்
	Kavizh thumbai.	பை.
Trichodesma zeylanicum, Br.		

Convolvulaceae.

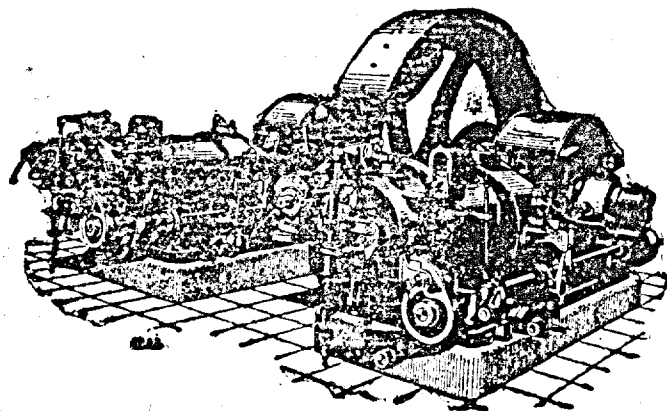
Ipomaea calycina, Bth.		
Ipomaea pentaphylla, Jacq.		
Ipomaea Pes-tigridis, Linn.	Tiger-footed	பூனைக்கொரை.
	Ipomaea.	
	Poonai keera.	
Ipomaea Pes-tigridis, Linn.		
Var hepaticifolia.		
Ipomaea eriocarpa, Br.		
Ipomaea reniformis, Chois.	Elikkathu keera.	எலிக்காதுகொரை.
Ipomaea sepiaria, Koen.	Thalikkirai.	தாளிக்கொரை.
Ipomaea aquatica, Forsk.	Vellai keera.	வெள்ளைக்கொரை.
Convolvulus Rottlerianus,		
Chois.		
Convolvulus arvensis, Linn.	Bindweed.	பூமிச்சக்கரப்பூண்டு.
	Bumichakra poondu.	
Evolvulus alsinoides, Linn.	Vishnu kirandi.	விஷ்ணுகிராந்தி,
Solanaceae.		
Solanum xanthocarpum,		
Schrad.	Kandankatri.	கண்டங்கத்திரி.
Physalis minima, Linn.	Thakkali.	தக்காளி.
Withania somnifera,		
Dunal.	Amukkarangilangu.	அமுக்கரங்கிழங்கு.
Datura fastuosa, Linn var	Oomathan.	ஊமத்தன்.
alba.		
Scrophularineae.		
Stemodia viscosa, Roxb.		
Herpestis Monniera,	Neer pirami.	நீர் பிரமி.
H B & K.		
Striga lutea, Lour.	Palli Poondu	பல்லிப்பூண்டு.
Striga euphrasioides, Bth.	(parasitic)	

C. TADULINGAM.

(To be continued).

(v)

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THE JOURNAL
OF
The Madras Agricultural Students'
Union.

Vol. III.

May 1915.

No. 5.

The Madras Agricultural Department.

We welcome the appearance of the Notes recently prepared by Mr. Chadwick on the origin and development of the Department. If it is true that happy is the nation which has no history, the Madras Agricultural Department must in the past have borne more than its share of affliction, for Mr. Chadwick's narrative pictures its varied career, and the frequent changes which its centre, the Saidapet College, was made to undergo.

We are often told that Saidapet was a failure, and this is largely true, but the lessons to be learnt from its failure are many, and we are thankful to Mr. Chadwick, firstly for his clear statement of the causes, many of them not on the surface obvious and easy to see, of this failure, and secondly for his sympathetic treatment and real appreciation of the benefits which the Department at

present is enjoying as the result of the workers at Saidapet.

(There are four of these notes, of which the first two will appeal specially to the older members of the Union, since they deal (i) with the general history of the Department and (ii) with the early efforts to develop agriculture with notable results obtained and the causes of failure. The historical sketch of the Department traces clearly the incessant changes due to the varying policies that prevailed at different times. The author divides the period 1866-1896 broadly into three decades, the first of which was characterised by the ascendancy of the idea of a model farm worked on western methods; the second decade was dominated by a barren discussion on agricultural education, the third was doomed to fall a prey to agricultural statistics. The note shows how each of these ends, though excellent in itself, yet failed to produce much tangible result when overdeveloped to the exclusion of the others, while the absence of any attempt at investigation, local enquiry or scientific research was fatal to any real progress. The second note deals more in detail with the various lines of work taken up and the reasons why they failed to produce any result commensurate with the money and labour spent on them. The most obvious reasons are said to have been the utter inadequacy of the staff, and the lack of knowledge of local conditions and facts. The heads of the Department responsible for the initiation of policy were too much tied to headquarters; it is with amazement that we learn that Mr. Benson did not get away on a district tour for more

than five years after he joined service. Such seem now to be obvious mistakes, but we must remember that it is only Saidapet experience which makes them obvious, and there is no doubt that the lessons learnt in Madras during these years of comparative failure have been of immense benefit. The Madras Agricultural Department has a tradition dating back many years, and Mr. Chadwick pays a kindly tribute to the assistance which the Saidapet men have given and are giving in setting the reconstructed Department on its path of success.

Improvement of Crops.

Systematic breeding of cereals has long been practised in all European countries and America. Recently, considerable amount of work has also been done in India in wheat, a very important cereal of Northern India, towards the improvement of local wheats by selection and crossing. There are two methods by which improved and new varieties may be obtained, namely 1. by *selection* and 2 by *cross breeding*.

Selection.—A renowned authority on plant breeding states that "Selection is the surest and the most powerful instrument man possesses for the modification of living organisms." It consists merely in the choice of the best individuals for the propagation of seed and it is by means of selection exercised through centuries that our cultivated plants have attained their present standard of excellence. Selection in its general sense is practised by every farmer, when he chooses the best variety suited to his soil and climatic conditions and reserves the best portion of his crop for seed. Selection in livestock is understood, appreciated and put into practice more than in the case of crops. Wherever possible, special care is taken by every ryot in choosing the best bull for his cow that he might get the best calf out of it. In the Central Farm we see dozens of animals being

brought almost every day for service by ryots from adjacent villages. Similarly a plant breeder should take the greatest amount of pains in selecting the variety of crop for his land, in selecting his seed, and in selecting the plants whose produce is to be used as seed.

That there is necessity to choose a variety for one's land is now understood by every farmer as the difference in yield between two varieties grown on the same farm under similar conditions side by side is sometimes sufficient to pay the cost of production. Carefully conducted experiments in every country demonstrate that it pays a farmer to give careful attention to the selection of his seed. Good plumpy grains used as seed are always found to be better than thin and light grains i.e., the higher the specific gravity of a grain, the better it is for seed purposes.

Now the term selection, in its restricted meaning, has a technical significance and implies the systematic choosing of specific plants for future reproduction, with the object of bringing about an amelioration of type. It recognises that there are endless variations in type in an ordinary crop and no two plants are alike. Selection seeks to isolate those types of plants which approximate most nearly to the ideal and to choose systematically from the produce of these types the variations which are likely to be of material value. This is the manner in which most of the improvements in our crops have occurred. Several desirable modifications have been effected in some plants through long years of cultivation as in the case of the cabbage (for leaves), the cauliflower (for inflorescence), the mango (for sweet pulp and diminution of seed) and the orange (for internal hairs). These modifications are due not to the attempts made by the grower to evolve these specific forms but to the long continued selection of variations which were considered desirable. An instance in which improvement has been effected from systematic breeding work is the common beet which contains about 7% of sugar, but has been developed into the sugar beet containing about 20% of sugar.

Selection is of two kinds:—1. Mass selection and 2. Individual selection.

Mass Selection consists of the continuous and repeated selection of a number of the best grains, best ears or best plants. It is supposed that, by the repeated selection of a number of good plants each year, the race as a whole will be gradually improved. As to the efficacy of the method, there has been difference of opinion even among famous breeders like DeVries and Fruwirth. Mass selection has been found to be most effective when the individual plant is made the unit of selection and not the individual grain or ear, for, it may sometimes happen that large ears are formed on comparatively poor plants. Mass selection tends towards improvement of the type, as only the best plants are taken for propagation, excluding the rest. It may happen that the plants we select, are better than others on account of some favourable environment, such as their having received more manure than others as a result of uneven distribution of manure in the field or having been given more spacing than others. However, the repeated and rigorous selection of the best plants would gradually confine the choice to permanently superior plants, and the general character will improve in the desired direction. It is this method of selection that has been practised in all German Experimental Stations with great success. This method, to be completely effective, must be continuous and uninterrupted i.e., the selection must be kept up every year to counteract any tendency on the part of the plant to degenerate.

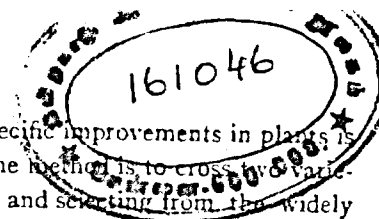
Method of doing Mass Selection:—The crop is carefully inspected at harvest time and a sufficient quantity of the best developed seed from robust and prolific plants is collected. This is grown separately next year in a small plot known as the stud plot. At harvest time selection is made in this stud plot and this is used as seed for the stud plot of the succeeding year. The balance is collected and sown as a seed plot in a large area for the year and the harvest of this becomes the seed for the whole of the farm in the third year, i.e., the selection of the stud plot in 1915 is used for the stud plot of 1916 and the balance used as seed plot of 1916 which becomes the seed for the whole farm in 1917. Thus after three years, the selection becomes automatic. The full effects of the process will be felt only at the end of three years, the time taken by the stud plot to become the bulk plot. Thus we see

that there is no complication about this method and it can be effectively applied by all farmers to improve their crops. It must be only continuous and uninterrupted.

Individual Selection:—When the individual plant or ear is made the starting point we have what is known as individual selection. It consists simply in isolating individual plants of promising appearance and multiplying the seed of their types as rapidly as possible. There is but one initial selection followed by rapid multiplication of the progeny. Here the selection begins with a number of superior plants of a variety and the seeds from each plant are separately planted and kept under continued observation. This enables a strict comparison to be made of the progeny of each selection so that in a few years the best strain of the original selection may be determined and multiplied for future use. This method assumes that repeated selection is unnecessary.

Another example of individual selection is that adopted by Hays, founder of the American Genetic Association. His method consists in isolating the most promising types of plants in a crop and testing the efficiency of the selection by comparing the prolificacy of a definite number of plants, say 100, from each of the strains so isolated. The total produce of 100 plants in each strain is taken as a measure of the prolificacy of that strain. A great majority will give only an average yield, a few a very poor yield, and a few give an exceedingly high yield and it is these last that are used for further selection. This method is better and more effective when we want an increase in the prolificacy of a given variety rather than an improvement in some specific quality.

Individual selection is more complicated and requires elaborate records and trials for its successful application. This is generally done only in Experimental Stations. In attempting an improvement in a given strain by any of the methods described above, care must be taken to avoid choosing those plants which are better than their neighbours by accidentally favourable circumstances, as more manure, richer soil, more spacing etc., and this requires considerable judgment on the part of the grower.



The second method of effecting specific improvements in plants is by cross breeding or hybridisation. The method is to cross two varieties possessing divergent characteristics and selecting from the widely varying progeny those particular individuals which possess in the highest degree the specific qualities which we are seeking. This kind of work can only be done by a scientist and is beyond the possibilities of an ordinary cultivator.

K. RAMIAH,

Assistant to Government Economic Botanist.

Jaggery Making at Kunigal.

A pleasant and interesting excursion was recently made by the writer to see a power mill and jaggery boiling plant erected at Kunigal, a village some 45 miles from Bangalore. The improvement consists mainly in the furnace which is so constructed as to possess a high heat efficiency and obviate the necessity for using extra fuel. The pans are arranged in batteries of three, with a fourth reservoir where the juice can be stored. The highest pan, which gets the least heat, is just at the boil; the middle pan receives enough heat to keep boiling briskly, and it is calculated that here about half the evaporation is done before the juice is run into the third pan, where it is finally boiled down to the right consistency. This last pan can be tilted up by means of a pulley and chain, and the thick juice run out into a wooden box from which it is poured into the moulds. The process is thus continuous, a pan being taken about every hour from each battery. Each change of juice fills the pan to a depth of about 5 inches, and the weight of jaggery produced is about 125 lbs.

At Kunigal, at present only one pair of batteries has been erected, though it is calculated that to keep the mill steadily and continuously at work, there should be two pairs. The mill is driven by a 12 H. P. Oil Engine and is a three roller mill of 18 inches width, giving a very good percentage of extraction.

The jaggery made is of the usual type. Skimming is not done, as the owners of the cane prefer that the scum should be left in, and though we saw some excellent samples of jaggery, showing what could be done, most of the stuff was dirty and of a poor colour. The local moulds produce a block of the shape of the Coimbatore block, but with a hollow centre and larger, each block weighing about $\frac{3}{4}$ lb.

Such is the plant: what of its commercial success? It appears that the expense and difficulty of milling cane in the ordinary way is a serious obstacle to the cultivation of cane in these parts. Judging from what was gathered when enquiring about the cost of threshing, this is probably the case, and the cane grower has to spend more than is customary here at Coimbatore, where the problem is not so acute. The cost to the ryot of producing 100 blocks of jaggery was given by the assistant in charge of the plant as Rs. 1-4-0 at the factory, and Rs. 1-3-6 by the ryot himself using bullock mills. That the ryot evidently thinks it worth while paying a little extra for the greater convenience of the factory, was clear from the bundles of cane lying waiting to be milled which were seen there, and by the amount of jaggery which was stored awaiting the payment of the milling fees. These, by the way, are four annas a maund of jaggery.

The profit of the factory is a more difficult matter to calculate. Mr. Chatterton * who is responsible for setting it up, and who has himself designed the arrangement of the pans and the construction of the furnace, states that two annas a maund will cover all expenses. If this figure is correct, it is only a matter of getting enough cane to keep the mill working a reasonable time and this is determined by many factors. In Mysore, the cane is kept on the ground frequently so long as 18 months, and yet may be ready after 12 months, so that it seems reasonable to expect a fairly long season. The distrust with which the plant was first regarded is rapidly breaking down, and recently a rival plant, on a smaller scale and without the mill, has been erected. If the erection of the plant increases the profits which the cane grower will obtain, it will have done well, and will serve as

*(Vide the Mysore Economic Conference Bulletins 12 and 21).

an interesting example of one of the many cases when the Engineer can be of service to the Agriculturist.

R. C. WOOD.

Burnt Earth.

Manure supply is a vexed question in Agriculture. In many districts, particularly in Malabar the manure supply is very limited. The ryots as a class almost everywhere are very reluctant to invest money for the purchase of manure, though the fact remains that the investment of money for the proper manuring of crops is almost the best, one can think of.

To quote an instance, one, Pondiat Kelu Nair of Perungulam (Kottayam Taluk) spent Rs. 10 for manuring $\frac{1}{2}$ an acre of his paddy land with fish. He got Rs. 22 worth of paddy more than the usual yield. His next door neighbour who is not a poor ryot and who has been closely watching the crop of Kelu Nayar, when questioned why he is not copying the practice, says "Well, Sir, fish manure is good. I have no money to purchase it."

The endeavour of all the persons interested in the cause of Agricultural improvement must therefore be to find out the cheapest manure. It must take time before common ryots go in generally for costly manures.

South Canara ryots are famous for shrewdness and careful farming. Burnt earth is one of their most favourite manures. It is prepared in a simple way. Alternate layers of earth, very often clay soil, and combustible matters such as any kind of dried leaf, useless paddy, ragi or any other straw or stumps or chaff are heaped.

The layer of soil will generally be about a span high and there is no fixity about the thickness of combustibles. The total height of the heap is about 4 to 5 ft. and the diameter of the heap about as much. The heap is fired. It burns slowly and well. Very powdery earth, mixed with ashes and unburnt particles of organic matter, thus

obtained is called "Sadumannu" or burnt earth. It is used for manuring all kinds of crops such as sugarcane, chillies, brinjals and other vegetables and paddy nursery—and all with very good results.

M. GOVINDA KIDAVU,
Farm Manager.

Report on Single seedling Planting in green manured lands.

In the beginning of June '14 (end of Edavam) 2½ edangalis of cowgram (1½ madras measure) were sown on 25 cents of single crop land and 5 edangalis arigan seed were sown on 5 cents of nursery. The only operations done to the seed bed were that 5 baskets of cow-dung manure were applied and the nursery was ploughed twice. The nursery was treated quite similar to broad casted fields and one hand weeding was given to it. The other 25 cents of land were ploughed twice before sowing the cowgram, with an idea that the seedlings would be sufficient to transplant the 25 cents of land. I had ploughed the field twice and levelled after the lapse of 30 days and kept the land ready for planting. After 40 days the seedlings were pulled and tied into bunches. At the time of pulling the seedlings, it is the practice to get the nursery filled by water in order to remove the small lumps of earth which clings to the roots of the seedlings and then tie them into bunches. The seedlings were planted singly in rows of 9 inches to 1 foot apart in the aforesaid field. The crop was better in appearance than the ordinarily planted crops. The seedlings were sufficient to plant the whole plots. The planted seedlings began to tiller in a fortnight and put forth 8 to 12 tillers in 20 or 25 days. Ever since the crop was transplanted, there was rain enough for paddy crops. It came up well, improving in appearance day by day. This crop as well as other crops were affected with grasshopper which usually attack paddy, especially in this year. Even then the plants grew well with dark green appearance. The ears began to come out almost in all at the same time and ripened with well filled appearance and the crop was ripe enough for harvest one week before the ordinarily transplanted

crops. The produce of grain from 25 cents of land was 55 paras measured with an ordinary para (one para=6 madras measures) and the outturn of straw was 200 hand bundles. I am cultivating personally the above land for the last 4 years and, so far as my experience goes, there was never such an outturn from this land. The average yield was 7 paras per 1 paraland or 10 cents. Generally the above fields were irrigated with river water, but this year, as there was sufficient rain, no watering was required. An equal plot of field near the above plots was cultivated in the ordinary way and the outturn was 20 paras of paddy and 170 hand bundles of straw. This land was manured with 1 cart load of cowdung manure. The wages required for transplanting the former 25 cents were one and a half times more than what is required in the ordinary planting, whereas the quantity of seeds required for the former plots is nearly half of what is required to the other plots. In planting in rows there is the advantage of having greater interspace in weeding for the coolies to move about without damaging the plants. Having come to know the advantages of single planting I give out the results of my personal experiences so that others may derive similar benefits.

I therefore entreat all the cultivators to bestow their careful attention on all these points and to adopt in practice this good and profitable method of single planting in green manured lands without entertaining any doubts in their minds.

Parai
1—3—1915. }

V. PONNAN PILLAI.

The Coconut Palm.

It has been said that there are as many uses for the Coconut Tree as there are days in the year and, though perhaps this is not quite accurate, there is no doubt it is one of the most useful trees in existence and no part of it from the leaf to the root is wasted. The cultivation, therefore, of such a useful tree is worthy of more attention than is usually given to it.

Seed Selection:—To consider the cultivation from the commencement, we must begin with the planting of the nuts. It is probably not recognised that the selecting of the nuts for planting is a most important matter. One can readily understand that inferior nuts will produce inferior trees, and nuts from healthy, matured and good bearing trees are likely to produce a similar class of trees. Large nuts are not usually the best as they are composed so largely of fibre. Medium sized, round nuts contain more copra, and copra is the better paying product.

Planting:—The usual method is to plant the nuts where the tree is ultimately wanted but planting in nurseries and transplanting out about a year later has many advantages. The young trees can thus get greater attention—artificial watering is facilitated and shade is more easily arranged. In the nursery, plants may be kept only a few inches apart. When planting out, it is advisable not to place trees too close, or, in due course, growth is hindered and the yield reduced. Planting should of course be done during the Monsoon and transplanting during the following Monsoon.

Soil:—Coconuts grow best in the ground with a damp sub-soil, but stagnant water is derimental as the feeding area of the roots is limited to the surface and the palms are more readily blown over by the wind.

Growth:—Trees usually commence to bear at the age of 7 to 8 years but, under favourable circumstances, it may be a year or two earlier and in 10 or 12 years trees should be fully matured and bearing plentifully.

Manuring:—The bringing of the tree into bearing at as early a date as possible is an important matter and it has been found that the best way to accomplish this is to manure the trees. Cattle and Green Manures which are widely used have beneficial effects but they do not provide the whole plant food of the tree and it is necessary, if the best results are required, either in mature or immature trees, to manure on a more scientific scale by adding potash to the phosphoric Acid and nitrogen which the above mentioned manures supply. The best source

of Potash for the Coconut tree is Kainit which is a whitish salt and it can be applied alone or along with other manures—preferably it should be made up in the mixture with suitable proportions of the other plant foods and an application of such a mixture is sure to well repay the cultivator.

Application of manures:—The manure should be applied round the tree about 2 or 3 feet away from the stem and lightly worked into the soil at the rate of 1 lb. for every year of the tree's age—the maximum application at one time is from about 10 or 12 lbs., but for old trees which require a strong reviving manure, 15 lbs. is necessary. Specially in the case of old and unhealthy trees the benefit of manure cannot be expected to appear all at once as if by magic, and one application of manure is usually not sufficient to revive the vitality but, after 2 or 3 years, the industrious cultivator will reap a rich reward. This is no myth as it is being proved every day in Malabar and there is no reason why you should not benefit.

Results obtained from manures:—Theory is not always fully supported by experience. However, in the manuring of the coconut, experience shows that the benefit exceeds what theory would lead one to expect and the following instances fully prove this.

Six years ago a certain paramba contained 48 old trees, probably about 20 years of age which were in a poor state, many of them not bearing more than 3 or 4 nuts only, and no manure was being applied. Since then these trees have been receiving an annual application of manure and we give below a note of the nuts actually harvested each year:—

	nuts.
1907	516 average per tree 10½.
1908	861
1909	1598
1910	1424
1911	1849 average per tree 38½
1912	943 *Shortage caused by unfavourable weather.
1913	2083
1914	2298 average per tree 48.

The increase in yield from 10 to 48 nuts per tree is very large and was secured at an outlay of manure of about 6 to 8 annas per tree. The enormous profit made is at once visible.

The undernoted figures represent the yield obtained by another cultivator. Presuming that the nuts were sold @ Rs. 5/- per 100, the increased income in 1914 was Rs. 125/- against the cost of manure applied Rs. 62/- which leaves an increased profit of Rs. 63/-

1912 nuts gathered	4011	- average per tree	62.
1913 do.	4405	- " " "	69.
1914 do.	6512	- " " "	101.

The above mentioned results were obtained from Messrs. Peirce, Leslie & Co. Ltd's., Special Coconut mixture and there is little doubt but that any one can obtain a similar increase in his coconut crop by applying this manure.

[*Note by Editor*:—The above contribution was sent by the agent of Messrs. Peirce, Leslie and Co, Calicut, and we shall be glad to publish actual experiences by individual cultivators. We may, however, state that Kainit which is imported from Germany may well be replaced by saltpetre and to a lesser extent by plant ashes.]

Notes.

"No single advantage could be afforded to the vast rural population of India that would equal the introduction of an improved system of agriculture".—Court of Directors in the Educ. Despatch of 1854.

The great European war and the consequent dislocation of sailings throughout the world has created a novel situation in the Hawaiian islands. The sugar factories are experiencing a serious shortage in bags (gunny?). About 11 millions of bags are annually imported into Hawaii for the Sugarcane crop alone while coffee, rice and other industries take up another million. To get

over this difficulty it is in the air to try and compress the sugar into large blocks. We should soon be prepared to see large blocks of Sugar being rolled into, and out of, steamers trading in sugar.—T. S. V. (*From the Louisiana Planter*).

The March 20th number of the 'Illustrated London News' contains the picture of a churn worked by a revolving wheel behind the present battle line in France. The wheel is driven by a large dog of the Retreiver type caged inside it. The dog is made to run inside the wheel and its continuously shifting weight rotates it. This reminds one of the see-saw waterlift, wherein the weight of an animal was utilised, which the late Rao Bahadur C. K. Subba Rao tried to bring into use for irrigation purposes. He demonstrated one such in the Government Farm at Palur near Nellikuppam about the year 1907 but unfortunately he did not live to see it completed. His appliance consisted of an enormous wheel attached to a see-saw with a bull treading on the latter and causing the wheel to rotate. This was made to work a chain of self discharging buckets fixed to the well from which it was desired to lift water. (T. S. V.)

Part of cane stalk most suitable for cuttings:— For various reasons the general consensus of opinion is that tops are most suitable. Points which seem of importance are (1) that, in general, the top sets are to some extent protected by leaf sheaths and the eyes are consequently better protected from injury (2) eyes of top sets are fresher and more ready to germinate when put in the soil, while on the contrary eyes of body sets often have dry hard scales which might hinder germination, and (3) eyes of body sets are more often killed by either the ring disease or the red rot or by the stalk borer. A fourth consideration is that body sets have sugar that must be converted into other materials before it is available as plant food, while the top seed actually has its food

in an available form. Thus the germination of the body sets would be delayed. J. C. R. (*Bulletin of the Sugar Producers' Association of Porto Rico*.)

The Effects of Electric Discharge on Plants:—Many experiments have been made during recent years in which plants have been subjected to an electric discharge from an overhead system of wires during a considerable portion of their growing period, and, as a result, *acceleration of growth and increase in yield* have been reported. Priestly, as the result of experiments, in collaboration with Knight, showed that direct currents have no effect on the *respiration* of peas (plant experimented). These results do not, of course, mean that the acceleration is inexplicable, for one result of electrification may be increased *transpiration*, which alone would account for a more rapid attainment of maturity by the plant, while various observers have found that electrification produces increased activity of constructive metabolism the process of building up food materials in the plant.

K. Cherian Jacob. (*"From Knowledge."*)

Seed Selection:—The fact that certain individuals are better than others has long been acknowledged and, wherever the principle of selection has been recognised and applied in practice, successful results have been obtained by the stock breeder and the horticulturist, in the production of a better class of animals and fruits respectively. The principle has recently been made use of in the growing of cereal crops. One European plant breeder has evolved a wheat plant, after careful and repeated selections, which has now become a highly productive variety. Barley has similarly been worked by another. In a rice field, every plant is not necessarily like every other of the same variety. Some individuals are met with which possess an inborn capacity to produce much grain and can transmit that capacity to their progeny. There is nothing so potent in plant industry as the

knowledge that production can be largely increased and desirable qualities enhanced by the simple methods of seed selection.—K. Ramiah. (*From the Philippine Agricultural Review*.)

In the case of ragi crop, a practice of getting a firm seedbed is obtained by passing a paluku over the broadcasted seed and then allowing sheep to tread. This is in vogue in portions of the Uttankarai Tq. of the Salem Dt. The paluku is used for inter-culturing later when the plant is about a span high. This is done only for ragi and not for other crops. This ragi is of course rainfed. The yield is about 480 mm. per acre. W. R.

There is a variety of ragi in Jammanahalle firka of the Uttankarai Taluq which goes by the name of "Peria angam." It is a six months' crop. This is said to be resistant of disease and the best yielder of grain, and it is rain fed. W. R.

Prickly pear is palatable to dairy cows and, when fed in amounts varying from 60 to 100 lbs. a day, makes the cow very thrifty and productive. Larger amounts are too laxative in effect. 1 lb. of cotton seed hulls equals 8.8 lbs. of pear. By substituting 60 to 75 lbs. of pear for a portion of dry roughage, the percent of fat in the milk dropped 42 per cent on the average, but the milk flow increased. Cows fed with pear drank less water. This shows pear to be a valuable food when there is scarcity of water. One man can singe a ton of pear in fifty minutes with a gasoline torch, using 1½ gallons of gasoline. Prickly pear must be given mixed with cotton meal and other dry roughage and should never be the sole ration. K. K. RAO. (*From the Journal of Agriculture, Victoria*.)

Weeds:—A novel method of destroying weeds along railway tracks comes from Illinois, America. A brush heavily charged with electricity is drawn along a few inches from the ground. Every plant touched is killed, and the cost of treatment is said

to be insignificant. J. RAO. (*Journal of the Department of Agriculture, Victoria*).

Sugar wards off fatigue:—General Joffre is not much of a smoker but invariably carries a supply of sweets to munch. Scientific experiments carried out with the aid of the ergograph—an instrument designed for registering variations in muscular power—show that sugar gives an increase in physical power of from 60 to 75%. It may be that the final settlement of the European War will be determined by the quantity of sugar each nation is able to obtain. T. S. V. *The Louisiana Planter*.

Bamboo clumps in the forests have this year flowered spontaneously in South Canara. Such clumps as have flowered are all dead and the general information is that such things happen once in 60 years. May I know if a similar observation has been made by others? Has this any bearing on the flowering of sugarcane?—B. S. Tolar.

The pans introduced in South Canara from Coimbatore for boiling sugarcane juice are now used largely for boiling paddy. The boiling is quite uniform and is certainly considered here an improvement over the old fashioned vessels.—B. S. Tolar.

Diploma Examinations, 1915.

PART I.

Mycology. Examiners. { Dr. L. C. Coleman.
Mr. W. MacRae.

First Class.

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|-----------------------------|------------------------------|
| 1. { Narasimbachari, L. | 5. { Duraiswami Aiyangar, G. |
| 2. { Sankaran Pillai, K. S. | 6. { Gopalakrishnayya, A. |
| 3. { Gopalan Nair, A. | 7. { Srinivasan, C. R. |
| 4. { Ramaniatha Aiyar, V. | 8. { Shinappa Tolar, B. |
| 9. { Adinarayana Rao, K. | |

Second Class.

- | | |
|------------------------------|---------------------------|
| 10. Kunhappa Nambiyar, E. K. | 13. { Sanjiva Rao, K. N. |
| 11. { Jacob, K. M. | 14. { Swami Rao, R. |
| 12. { Subba Rao, K. | 15. { Balakrishnan, M. A. |
| 16. Jivana Das, R. | |

Third Class.

17. Vridhachalam, U.

Entomology. Examiners. { Dr. L. C. Coleman.
Mr. E. Ballard.

First Class.

- | | |
|----------------------|---------------------------|
| 1. Gopalan Nair, A. | 3. { Gopalakrishnayya, A. |
| 2. Srinivasan, C. R. | 4. { Ramanatha Aiyar, V. |

Second Class.

- | | |
|-------------------------------|---------------------------|
| 5. { Kunhappa Nambiyar, E. K. | 10. { Adinarayana Rao, K. |
| 6. { Subba Rao, K. | 11. { Vridhachalam, U. |
| 7. { Duraiswami Aiyangar, G. | 12. { Narasimbachari, L. |
| 8. { Sankaran Pillai, K. S. | 13. { Sanjiva Rao, K. N. |
| 9. { Shinappa Tolar, B. | 14. { Swami Rao, R. |

Third Class.

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|-------------------------|------------------|
| 15. Jivana Das, R. | 16. Jacob, K. M. |
| 17. Balakrishnan, M. A. | |

Departmental and Estate Notes.

The Inspector of European and Training Schools, Madras, advertises in the Fort St. George Gazette 3 vacancies of Agricultural Instructors on Rs. 50/- in the Government Training Schools at Bellary, Villupuram and Nellore from Diplomates in Agriculture whose vernaculars are Canarese, Tamil and Telugu respectively. The first two are permanently vacant and the last is, for the present, a vacancy lasting for a year.

According to the newly proposed scales in the Agricultural Department, Licentiates in Agriculture will start on Rs. 50-5-125, with prospects of promotion to higher grades and to the

Provincial service. As good men are required for the Educational Department, and as such men are expected to remain in the Department, we respectfully beg to invite the attention of the Director of Public Instruction, either to give Agricultural Instructors progressive salaries on the same scale as in the Agricultural Department, or to adopt the system followed in the recruitment of the staff of the Engineering College, whereby, according to a mutual arrangement between the Heads of the two Departments, agricultural subordinates may be lent to the Educational Department, and vice versa, for specified periods. Our readers will remember that this subject was one on which the members of the Union decided to make a representation to the Director of Agriculture, two years ago, through their then Vice President, the late Rao Bahadur J. Dharmaranga Raju.

The Ex-Students of the late College of Agriculture at Saidapet will be gratified at the following testimonials given by the present sympathetic Head of the Agricultural department, extracted from his Notes on the Origin and Development of the Department in Madras:—

1. From among the staff of the old department and from the old students of the Saidapet College it was possible to collect a few well trained subordinates, who, for the first five years, have been the backbone of the department and have done excellent work. Without them, it would have been impossible to achieve as much as has been done. Coimbatore does not disown Saidapet, nor does the new department scorn the experience and results of those earlier days.

* * * * *

2. It must be recognised that these results could not have been obtained in such a short time without the residuum of trained men bequeathed from Saidapet.

* * * * *

3. The department, as recently developed, knows and recognises what it owes to the men trained at Saidapet. K. K. Rao.

A meeting of the resident Officers on the Estate was held about the middle of April, with Mr. R. C. Wood, Principal, in the chair, when it was resolved to send voluntary contributions towards the Hospital ship "Madras" for a period of 6 months. A sum of Rs. 70/- will be sent monthly from the colony.

We are glad to announce that the Hon'ble Mr. Muppil Nayar of Kavalapara has kindly consented to become a patron of the Union. He is our first patron. It is gratifying to note that the enlightened aristocracy of the country is taking interest in our work. We confidently hope to add to the list of patrons before the next Conference in July.

Mr. Patel, L. Ag., extra Deputy Director of Agriculture, Konkan Division, Bombay and Mr. Raman Menon (Cambridge), Director of Agriculture, Cochin State visited the College and Farm during the month. Under the auspices of the Officers' Club, Mr. Patel gave an interesting account of Agriculture and Agricultural education in different European Countries to which he had been deputed by the Bombay Department of Agriculture 3 years ago.

Mr. M. Viraraghava Rao, L. Ag. has been appointed Assistant Farm Manager *vice* Mr. S. Subbayya on other duty as Farm Manager, 2nd Grade, *sub-protem*, and is posted to Anakapalle.

Mr. S. Sitaram Patrudu, L. Ag; has been appointed Assistant Farm Manager, *vice* Mr. T. Budhavidheya Rao on the other duty, and is posted to Anakapalle.

Madras Agriculture.

An Expansion Scheme.

The following Press Note has been issued by the Government of Madras outlining the scheme for the expansion of the Madras Agricultural Department sanctioned by the Secretary of State :—

The Agricultural Department was reconstituted in 1905-06 and the results of the working of the reconstituted Department are fully recorded in the annual Administration Reports. Although substantial progress has been achieved in the improvement of the agricultural practices and methods in vogue in this Presidency, the advance made has been practically restricted to eight or nine of the twenty three Districts and, owing to lack of staff, the Government have reluctantly been compelled to refuse frequent requests made by non-official members in the local Legislative Council and by District or other representative Associations for the opening of more farms and for the extension of work to Districts as yet untouched. The wide-spread desire for the improvement of agricultural conditions convinced H. E. the Governor in Council that further expansion of the work of the Agricultural Department ought not to be delayed and proposals were accordingly made to the Government of India to sanction staff sufficient for the opening of new farms, the strengthening of the staff of Deputy and Assistant Directors and substantial additions to the subordinate services. These proposals for the expansion and reorganisation of the Department of Agriculture have now been sanctioned by the Secretary of State. The main features of the scheme, which will be gradually given effect to as officers and funds become available, are briefly summarised below.

2. The Presidency will be divided into seven distinct divisions each in charge of a Deputy Director of Agriculture, assisted by a staff of field and farm subordinates. The proposed divisions, the wet and dry land tracts which they will serve and the new farms contemplated are shown in a statement :—

There are at present three Deputy Directors and four more will be added to the Indian Agricultural Service.

3. The Provincial Service at present comprises three appointments, namely, two Assistant Directors of Agriculture on Rs. 250—15—400 each and a Lecturing Botanist at the Agricultural College on Rs. 330—33—660. The cadre of this service will be increased to fourteen, of whom five, including the Lecturing Botanist, will be employed in the College, eight in the Districts under the Deputy Directors and one as Personal Assistant to the Director of Agriculture. The posts other than that of the Lecturing Botanist will be on the following scales of pay :—One on Rs. 700, one on Rs. 600, one on Rs. 500 and ten posts on Rs. 200—12½—400. Three of the posts at the College will be allotted to the science sections and the incumbents of these posts will be recruited chiefly from among University graduates possessing good scientific qualifications. The other ten posts will be filled partly by promotion of men in the upper subordinate branch and partly by direct recruitment of men with sound agricultural training.

4. The subordinate service will include the following appointments :—(1) Managers in charge of farms. (2) Teaching Assistants in agriculture at the College. (3) Assistants in the science sections other than the three included in the Provincial Service. (4) Assistant Managers at the farms. (5) Itinerary Inspectors (senior and junior). (6) Field-men in the science sections.

This service will be divided into 2 grades :—(a) an Upper Subordinate branch which will again be sub-divided into (i) an agricultural side and (ii) a science side and (b) a Lower Subordinate branch.

5. The Upper Subordinates on the agricultural side will consist of Farm Managers, teachers in the College and the senior District Inspectors and number 67 as shown below :—

Number attached to District Farms	...	19
Number attached to the Central Farm, Coimbatore	...	2
Teaching Assistants at the Agricultural College	...	5

District Inspectors	...	...	...	23
One Inspector in each Division	...	...	...	7
One extra Inspector in three divisions (the extreme south, the West Coast and Coimbatore and the Ceded Districts)				3
Leave reserve	...	...	...	8
				—
				67
				—

The District agricultural staff comprises at present the following grades:—26 Assistant Farm Managers on Rs. 35—3—50; 17 Farm Managers, second grade, on Rs. 50—5—100; 6 Farm Managers first grade, on Rs. 100—10—150; 2 Teaching Assistants in Agriculture at the College one on Rs. 150—20—250 and one on Rs. 50—10—150.

This branch of the Upper Subordinate service will be open to men who have obtained the diploma of the Agricultural College at Coimbatore and the 67 posts referred to above will in future carry the following scales of pay:—42 posts on Rs. 50—5—125; 12 posts on Rs. 150; 8 posts on Rs. 175; 5 posts on Rs. 200.

6. The Assistants on the science side of the Upper Subordinate branch will be increased from fourteen to seventeen and they will be graded as follows:—10 appointments probationary for a period of two years at Rs. 75 and, after confirmation, carrying a pay of Rs. 75—5—125; 4 appointments on Rs. 150; 2 appointments on Rs. 175; 1 appointment on Rs. 200. These appointments will be ordinarily filled by graduates in science, though agricultural diplomates possessing particular aptitude for scientific work may be selected.

7. All the posts, whether agricultural or scientific, will be borne on one combined list so that the complete Upper Subordinate branch will comprise Farm Managers, Inspectors and Science Assistants. The combined cadre will stand as follows:—42 posts on Rs. 50—5—125; 10 posts on Rs. 75—5—125 (with two years' probation on Rs. 75); 16 posts on Rs. 150; 10 posts on Rs. 175; 6 posts on Rs. 200. Of these, the ten on Rs. 75—5—125 and seven on Rs. 150 or more will be reserved for the science sections. In addition to these, there are the

posts of (1) Assistant in agricultural engineering on Rs. 150—10—250 and (2) Assistant in veterinary science on Rs. 150—20—250 which will continue to be recruited as at present from the Public Works Department and the Civil Veterinary Department respectively.

8. The Lower Subordinate branch will include Assistant Farm Managers, Junior Inspectors and Field-men. The number of appointments will ultimately be 141 distributed in the following manner:—

(1) One for each District Farm	...	...	...	19
(2) Central Farm	...	...	...	3
(3) For dairy and stock at the Central Farm.	...	...	...	1
(4) One additional hand at the Hagari and Samalkota Farms	...	...	...	2
(5) „ „ at each of two of the new farms	...	...	...	2
(6) Three Assistant Inspectors in each district	...	...	...	69
(7) Two extra men under each Deputy Director	...	...	...	14
(8) Three extra men in the extreme south division	...	...	...	8
Two extra men in the West Coast division	...	...	...	
Three in the Ceded Districts division	...	...	...	
(9) Field men	...	...	...	12
(10) Leave reserve	...	...	...	11
				—
				141
				—

The incumbents of these posts will be recruited from among the holders of certificates granted at the end of the new two years' course at the College and will draw the following scales of pay:—198 appointments on Rs. 35—2½—75; 18 appointments on Rs. 80; 9 appointments on Rs. 85; 6 appointments on Rs. 90. Good men will be allowed to return to the College within five years of obtaining their certificate in order to undergo a further one and a half year's course for the diploma, on securing which they will become eligible for the Upper Subordinate branch.

9. The reorganisation scheme reviewed thus briefly will eventually be as follows:—

There will be the College and Central Farm at Coimbatore and nineteen experimental and demonstrational farms in the chief agricultural tracts of the Presidency. There will be seven Deputy Directors' divisions and each division will, as a rule, contain two main types of cultivation. There will be at least one Upper Subordinate in each District with extra hands in the more advanced tracts, and in each division there will be one spare man at the disposal of the Deputy Director for employment on special duties. At the College there will be twenty-two men in these grades or twenty-four including the engineering and veterinary assistants. The Lower Subordinate branch will help to man the farms and provide field men in the science sections. Three subordinates will be allotted to each District and there will be two reserve hands in each division who can be used by the Deputy Director to supplement the District staff where needed, with extra men in each of the three more advanced divisions.

The total extra cost involved by this scheme amounts to nearly Rs. 2½ lakhs per annum.

Some Weeds of the Central Farm, Coimbatore.

(Continued.)

Orobanchaceae.		
Orobanche Nicotianæ, Wight.	Bodu (parasitic on Solanaceous plants).	
Pedalineae.		
Martynia diandra, Glox. (introduced)	Puli nagam.	புலிகம்.
Acanthaceae.		
Hygrophila spinosa, T. Anders.	Neer mulli.	நீர்முள்ளி.
Calophanes Nagchana, Nees.		

Ruellia patula, Jacq.	Silandinayagam.	செவந்தியாகம்.
Blepharis boerhaaviae- folia, Pers.		
Blepharis molluginifolia, Pers.		
Barleria mysorensis, Roth.	Chulli mulli.	சள்ளிமுள்ளி.
Barleria noctiflora, L. f.		
Asystasia coromandeliana, Nees.		
Andrographis echiodies, Nees.	Gopuranthangi.	கோபுரந்தாங்கி.
Justicia tranquebariensis, L. f.	Thavasu murungai chedi.	தவசுமுருங்கைச் செடி.
Justicia diffusa, Willd.		
Justicia procumbens, Linn.	Kodaga salai.	கோடகசாலை.
Rungia repens, Nees.		
Peristrophe bicalyculata, Nees.		
Verbenaceae.		
Lippia nodiflora, Rich.	Poduthalai.	பொடுதலை.
Priva leptostachya, Juss.		
Clerodendron phlomoides, L. f.	Thalangi or Thazhudalai.	தாளாஞ்சி or தழுதலை.
Labiatae.		
Ocimum canum, Sims.	Nai thulasi or Kanjangorai	நாய்துளசி or கஞ்சாங்கோரை.
Ocimum gratissimum, Linn.	Ram thulasi.	ராம்துளசி.
Ocimum sanctum, Linn.	Thulasi.	துளசி.
Moschosma polystachyum, Benth.	Sanakki poundu.	சாணக்கி பூண்டு.
Anisomeles ovata, Br.	Erumuttai pinari.	எருமுட்டைபினரி.
Leucas urticaefolia, Br.		

<i>Lencas aspera</i> , Spr.	Thumbai.	தம்பை.
Nyctagineae.		
<i>Boerhaavia repens</i> , Linn.	Mukkarattai.	முக்காட்டை.
<i>Boerhaavia repanda</i> , Willd.	Chatti Chattaranai.	சட்டி சட்டாரணை.
<i>Boerhaavia verticillata</i> , Poir.	.	.
Amarantaceae.		
<i>Celosia argentea</i> , Linn.	Pannai keera.	பண்ணைக்கீரை.
<i>Celosia polygonoides</i> , Retz.		
<i>Digera arvensis</i> , Forsk.	Thoyyakirai	தொய்யக்கீரை.
	Chenchali Koora.	
<i>Amaranthus spinosus</i> Linn.	Muli keera.	முள்ளுக்கீரை.
<i>Amaranthus viridis</i> , Linn.	Kuppai keera.	குப்பைக்கீரை.
<i>Amaranthus polygamus</i> , Linn.	Siru keera.	சிறுகீரை.
<i>Pupalia atropurpurea</i> , Moq.	Adai otti.	ஆடைஒட்டி.
<i>Nothosæra brachiata</i> , Wight.		
<i>Aerua javanica</i> , Juss.	Poolai keera.	பூளைக்கீரை.
<i>Aerua lanata</i> , Juss.	Sirukkan Poolai keera.	சிறுக்கன் பூளைக்கீரை.
<i>Achyranthes aspera</i> , Linn.	Greenish, Nayuruvi.	நாயுருவி.
	Pinkish, Ser-nayuruvi.	செந்நாயுருவி.
Chenopodiaceae.		
<i>Chenopodium album</i> , Linn.	Chakravarthi keera.	சக்கரவர்த்திக்கீரை.
<i>Chenopodium ambrosioides</i> , Linn.	Kattu Omum.	காட்டு ஒமம்.
Polygonaceae.		
<i>Polygonum plebejum</i> , Br.		
<i>Polygonum glabrum</i> , Willd.	Aatalareo.	ஆத்தலரி.

Aristolochiaceae.		
<i>Aristolochia bracteata</i> , Retz.	Aduthinnapalai	ஆடு தின்னூப்பாலை.
Euphorbiaceae.		
<i>Euphorbia hypericifolia</i> , Linn.	Ammampacharisi.	அம்மாம்பச்சரிசி.
<i>Euphorbia hirta</i> , Linn.		
<i>Euphorbia rosea</i> , Retz.		
	Sevvammam-pacharisi.	செவ்வம்மாம்பச்சரிசி.
<i>Euphorbia thymifolia</i> , Burm.	Chinna Ammampacharisi.	சின்ன அம்மாம்பச்சரிசி.
<i>Euphorbia serpens</i> , Kunth.		
<i>Euphorbia prostrata</i> , Ait.		
<i>Phyllanthus maderas-patensis</i> , Linn.	Mela nelli.	மேலா நெல்லி.
<i>Phyllanthus Niruri</i> , Linn.	Keela nelli.	கீழாநெல்லி.
<i>Jatropha glandulifera</i> , Roxb.	Adalay chedi.	அதலைச்செடி.
<i>Chrozophora plicata</i> , A. Juss.	Guruga chettoo.	
<i>Claoxylon Mercurialis</i> , Thw.		
<i>Acalypha indica</i> , Linn.	Kuppai meni.	குப்பைமேனி.
<i>Acalypha ciliata</i> , Forsk.	Kuppai meni chakkalatti.	குப்பைமேனி சக்காளத்தி.
<i>Tragia involucrata</i> , Linn.	Poonai kanjan or kanjori.	பூளை காஞ்சான் or காஞ்சொறி.
Liliaceae.		
<i>Gloriosa superba</i> , Linn.	Kalappai kizhangu or Karthikai poo.	சலப்பைக்கிழங்கு or கார்த்திகைப்பூ.
Commelinaceae.		
<i>Commelina benghalensis</i> , Linn.	Kanangeera.	காளுக்கீரை.

Cyanotis axillaris, Roem & Sch.	Neer pulli.	நீர்ப்புல்லி.
Cyanotis cucullata? Kunth.	Amalai or Nayini poondu.	அமலை or நாயினிப்பூண்டு.
Arcideae.		
Colocasia Antiquorum, Schott.	Kattu sembu.	காட்டுச் செம்பு.
Lemnaceae.		
Lemna.	Duckweed.	
Cyperaceae.		
Cyperus difformis, Linn.		
Cyperus bulbosus, Vahl.	Bulb grass.	
Cyperus rotundus, Linn.	Korai kizhangu.	கோரைக்கிழங்கு.
	Indian nut grass.	
Eleocharis atropurpurea, Kunth.		
Fimbristylis dichotoma, Vahl.		
Fimbristylis miliacea, Vahl.		
Gramineae.		
Paspalum sanguinale, Lamk.	Nanabala gaddi.	
Eriochloa polystachya, H. B & K.		
Panicum Isachne, Roth.		
Panicum flavidum, Retz.		
Panicum Crus-galli, Linn.		
Panicum colonum, Linn.	Karumpul.	கரும்புல்.
	Otha Gaddi.	
Panicum prostratum, Lamk.	Gattu chippera.	
Panicum javanicum, Poir.		

Panicum repens, Linn.	Ginger-rooted grass.	
Setaria intermedia, Roem.		
Pennisetum Alopecuroides, Steud.		
Pennisetum cenchroides, Rich.	Kozhukkattai pul.	கொழுக்கட்டைப்புல்.
Tragus racemosus, Scop.	Kadai Pul.	காடைப்புல்.
Perotis latifolia, Ait.	Nari val pul.	நரி வால் புல்.
	Nakka thoka gaddi.	
Imperata arundinacea, Cyrill.		
Ischaemum ciliare, Retz.		
Apluda varia, Hack.	Pedda pedara.	
Rottboellia exaltata, L. f.		
Andropogon foveolatus, Del.		
Andropogon pumilus, Roxb.		
Andropogon pertusus, Willd.	Sevvarugu.	செவ்வருகு.
	Karapees.	
Andropogon caricosus, Linn.		
Andropogon annulatus, Forsk.	Molava gaddi.	
Isellema laxum, Hack.	Chengali gaddi.	
Aristida Adscensionis, Linn.	Siru thudappam pul.	சிறு துடப்பம்புல்.
Aristida Hystrix, Linn.	Ooba gaddi.	
Sporobolus coromandelianus, Kunth.		
Cynodon dactylon, Pers.	Arugam pul.	அருகம்புல்.
	Garika.	
Chloris barbata, Sw.	Mayl kondai pul.	மயில் கொண்டைப் புல்.
	Uppu gaddi.	
Chloris montana, Roxb.		
Eleusine brevifolia, Br.		

Eleusine ægyptiaca, Desf. Mattangai Pul. மத்தங்காய்ப்புல்.
Kaval gaddi.

Dinebra arabica, Jacq.
Eragrostis tenella, Roem
var plumosa.

Eragrostis interrupta, Beauv.
Eragrostis major, Host.
Eragrostis minor, Host.

Marsilea quadrifoliata, Linn. Arai keerai. ஆரைக்கீரை.
Chara.

C. TADULINGAM.

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THE JOURNAL

OF

The Madras Agricultural Students' Union.

Vol. III.

June 1915.

No. 6.

The Tiruppur Cattle Show.

The Tiruppur Cattle and Pony Show held from 31st May to 2nd June is as important for the Southern districts as the Ongole Show is for the Northern half of the Presidency. The Show was organised by the Coimbatore District Agricultural Association and opened by the Hon'ble Mr. L. E. Buckley, Commissioner of Agriculture. Heads of several Departments were there with their subordinate staff; e. g., the District Collector, the Director of Agriculture, the Director of Industries, the Registrar of Cooperative Credit Societies and the Superintendent of the Civil Veterinary Department. It has been customary for the Principal and some of the scientific experts of the Coimbatore Agricultural College to send exhibits and otherwise help in making it a success. The Principal's section was represented this year by Mr. R. Ramaswami Aiyar, Acting Chief Assistant and Mr. K. Unnikrishna Menon, the new teaching Assistant.

The former gave a popular tamil lecture, accompanied by demonstration on the use of implements suited for garden and dry land cultivation, and also explained, with the help of magic latern slides, the improvements which the Department is suggesting for adoption by the ryot, in the matter of the growing of green manure crops and the economic transplanting of paddy. Mr. K. Unni Krishna Menon, though a Malayalee, spoke very well in Tamil and held a ploughing demonstration and a trial of different implements on 2 days. Both the discourses and demonstrations were followed with appreciation by the actual cultivators who formed the bulk of the audience and who asked a number of questions. It was pleasing to note that several ryots who had adopted the suggestions of the Department spoke of their actual experiences in green manuring and economic transplantation. Several spoke well of the better work done by the implements demonstrated. Two causes might be mentioned here which have awakened the interest of these cultivators. The largest Government Agricultural Station, namely, the Central Farm, being located at Coimbatore, several hundreds of land holders and cultivators, accompanied by Revenue officers of the different taluks, have visited the Farm on several occasions during these years, during which periods the Principal and his staff and students had taken enormous pains to arrange for suitable demonstrations, in addition to looking after their personal comforts. The cultivators who joined in the discussions at the lectures and demonstrations spoke highly of their impressions of the Coimbatore Farm and the lessons they practically learnt therein. The second cause is the deputing of a special Farm

Manager for district work. We have received for the last year and a half, several reports of the work done by Mr. W. Raghavachari, under the guidance of Mr. H. C. Sampson, both official and from actual ryots, and we may safely place to the credit of Mr. Raghavachari much of the successful work in the district, whereby cultivators have adopted the suggestions of the Department. The two methods of reaching the ryot mentioned above, namely, taking them to see a Farm where improved methods of cultivation are practised and sending an enthusiastic young man to their own villages, are the quickest methods of introducing wholesome changes in the farming of land. The Department recognises it and it is only insufficiency of trained hands that stands in the way of an expansion of work.

The Government Entomologist was at the Show with his assistant, Mr. C. Narayana Aiyar; and the latter gave an interesting discourse on Insect pests and some remedies to combat them, with the help of specimens and coloured drawings, and also practically demonstrated the use of spraying machines and how to bag insects.

The Show consisted essentially of 4 sections:—(1) Cattle. (2) Ponies. (3) An agricultural section and (4) An industrial section. The cattle which had been brought to the Show were, in the opinion of the judges, as usual of a high standard. The Pattagar of Palayakotta and, next to him, the Agricultural College, had brought the largest number of animals. People seem to be losing faith in *black eye*, so that a better quality and a larger number of cows had been exhibited. With regard to breeding bulls, Mr. D. T.

Chadwick, the spokesman of the judges, was of opinion that there seemed to be a tendency to select bulls more for their sizes and bones. The Kangayam cattle which are used to hard work on hard soil have certain characteristics which are necessary to be maintained in breeding, although size is not a factor to be ignored. The ideal Kangayam breed should possess good hard legs, well built backs and hard hoofs, and should move freely and quickly so much so that, in the class of mature bulls, the prize was awarded to a small sized bull as judged by its legs, feet and hoofs; and the same bull won the championship prize. There was an increase in the exhibits of animals brought by ryots paying not more Rs. 50/- kist. All the same, the Pattagar still deservedly holds the first rank as the breeder of Kangayam cattle. There were ploughing competitions and bullock carts' races introduced this year which might be developed, with better arrangements, in future shows.

Regarding the Pony Show, Mr. J. T. W. Filson was of opinion that it was a very good Show, esp. of young stock. Tiruppur ponies have a reputation as hardy animals and, now that motor traffic is largely displacing horse vehicles, one might prophesy that the time is not far distant when equine stock will be used for ploughing and other field operations as in other countries.

The agricultural section of the Show was on the whole very poorly represented. There were the museum case and a show of implements from the Agricultural College and Mr. Raju Naidu of Podanur displayed a well appreciated trophy of horticultural plants. Field grains which had been

sent by the exhibitors were not properly arranged. The Hon'ble Mr. E. F. Barber who was the spokesman of the judges in this section expressed a wish that the small cultivators might be better represented and that small shows might be organised in the different taluqs. He also pointed out a number of ways in which the exhibits might be better arranged.

Mr. K. T. B. Tressler, on behalf of the judges in the Industrial, section regretted that this year's Show was smaller than last year, several important industries of the district not being represented. There were, however, a few odd exhibits of interest, e. g., a large iron safe, neatly worked brass articles and reeling and preparation of silk. The small weaving competition which was held, was hardly representative of the weaving classes so largely present in the Coimbatore District.

Mr. T. A. Ramalinga Chettiar, the Vice President of the District Agricultural Association and the Secretary of the Show gave a history of the Association and the origin of the Show and said that the defects pointed out would be noted for future guidance. In acknowledging the help of the Agricultural Department, he said that several members of the Association were handicapped now and then; for instance, there was a great demand for fish manure, but fish manure was not available.

The Hon'ble Mr. Buckley, in his concluding remarks, said that, in view of the unfavourable season for the last 2 or 3 years, it was remarkable that the exhibits were brought

in a good condition and that the Show was a distinct success, for which he thanked the members of the local committee, esp. Mr. T. A. Ramalinga Chettiar and Rao Sahib A. Vittal Das Sait. He asked the members of the Association to take the suggestions thrown out by the judges, not in the light of fault finding, but in the spirit in which they were given, viz, the improvement of the Show in future.

The Hon'ble Mr. Barber distributed the prizes, consisting of several gold and silver medals and cash prizes up to the value of Rs. 1000. Three of the gold medals were awarded by Government for the best cow, the best bull and the best mare with foal at foot. Mr. A. R. Cumming, the Collector of Coimbatore and the President of the District Agricultural Association thanked the Hon'ble Mr. Buckley, the Hon'ble Mr. Barber, the judges and all others who helped to make the Show a thorough success.

Canes for Seed.

Cane crushing and planting are almost synchronous. There is not much difficulty in securing sound and selected sets for planting, if cane crushing is in progress. It is the universal experience in all cane growing countries that top portions of canes germinate better than the bottom ones, but advantage is not fully taken of this to the right extent. Several ryots in the deltaic tracts of Godavari remove and reserve the tops for planting as crushing goes on and, when they find sufficient tops to plant a fair area, they stop their crushing and proceed with the planting. This is a very easy matter when irrigation water is easily and readily available. The case is quite different in places like Palnad in Peddapur Taluk where it is not possible to plant

canes at the time of crushing, and the same is the case in the neighbourhood of Anakapalle. To provide sufficient seed for planting, portions of cane fields are left as "Stand Overs" and the rest crushed at the proper time when canes ripen. It is also the practice in certain villages of Vizag and Ganjam Districts to grow canes exclusively for seed purposes but not for crushing. The lands on which they are grown are slightly alkaline and the jaggery does not solidify if canes are crushed. Therefore in those places canes are grown solely for seed purposes, thus enabling the ryots who grow canes for crushing to crush their whole crop. When portions of fields are left as "Stand overs," it is very difficult to exactly gauge the amount of canes to be left sufficient to plant a definite area as different canes behave differently in their germinating capacity depending also on the time of cutting. Young canes germinate better than older canes. Certain canes, like the Red Mauritius, germinate uniformly throughout the length of the cane. All reed canes, as a rule, germinate well throughout the whole length of the cane. Rich juicy canes, like the Vellai, germinate properly when only the top halves are planted. Canes that develop aerial roots, like the Bonta, are to be selected carefully, avoiding all sets that have roots on them. Some of the recently introduced canes, like B. 208, have very prominent buds which shoot very badly, as the canes ripen, giving a good deal of trouble in transporting canes for seed. The accompanying photo* clearly proves how badly this cane shoots when left as "Stand overs" for planting. While recommending to the ryots any of these new canes, great care is to be taken in ascertaining the germinating power of such canes. The success of a cane crop entirely depends in getting a full and even stand to start with, by planting good and selected sets. There are several controversial points, purely of academical interest, which I have tried to avoid in this brief note.

D. BALAKRISHNAMURTI,
Farm Manager.

[* The photo is in the College Museum.—Editor.]

*** Paddy Cultivation in the Madras Presidency and the lines on which it can be improved, with special reference to the Tanjore District.**

The lines of improvement of paddy in the Tanjore District may, for the sake of convenience, be classed under the following heads.

1. Improvement in the present systems of farming.
2. Improving the methods of cultivation.
3. Improving the supply and use of manure.
4. Consolidation of the holdings.
5. Extending roads to wet lands.
6. Improvement in the irrigation of paddy lands.
7. Introduction or extension of commercial crops in rotation with paddy.
8. Using machine power for farm operations wherever possible.
9. Seed selection and improvement of crop by means of seed farms and demonstration farms.
10. Education of ryots about the insect pests and diseases and the simple forms of combating them.
11. Introduction of such recognized improvements in estates under the Court of Wards.
12. Co-operation and formation of co-operative agricultural societies.

Systems of farming:—In this district the systems of farming are three in number, viz., Varam share system, lease system, and pannai or home farm system.

Varam system is the most extensive, being practised by most of the big landholders who own a great portion of the district and also by men who go out of the village to eke out a living in the nearest town. In this system the tenant does the whole cultivation, and takes a share of the produce. This is quite an easy going method for the land holder, for, whatever the produce may be, he gets his share of $\frac{1}{3}$ to $\frac{2}{3}$ according to the fertility. Big estates are managed with a few, low paid agents only in this way. It is such lands that are under the poorest conditions. The tenant who can only cultivate 2 acres under pannai system, cultivates more than 3 acres in Varam system and thus what he loses in the yield per acre, he gains by the increased extent cultivated with the same exertion and capacity.

* Being extracts from the Essay written by Mr. K. Raghavachari, L. Ag., Assistant Farm Manager, for the Munagala Prize, adjudged second.

Lease system:—This method, in which fixed money or grain rent is paid to the landlord by the tenant, is very good, but the temporary nature of the leases, makes the matter bad and the lands are never improved.

Pannai system:—This is the least practised in this district. By this system the landlord cultivates the land himself, keeping cattle and engaging permanent labourers, known as Pannaials or serfs. This system is generally the best and such lands are in a highly cultivated condition. The Pannaials are low paid, but get liberal presents and loans. Now-a-days, these coolies desert the lands and go away to foreign places where they get better wages: and the question now is whether the landlord can afford to pay such increase of wages as would stop emigration of coolies. The short period of work during planting and harvesting and the absence of work during the interval, make it difficult to pay the coolies a higher rate of wages all through the year. If he can make arrangements to engage the labourer during the off-season on some remunerative work, the question of increased wages is easily solved. That is to say, he must raise such other crops, along with or in rotation with paddy, such as sugarcane, plantains, and others, that would engage labour during other seasons also. Starting cottage industries, such as rearing Eri worms, extraction of plantain fibre and making ropes are other directions in which the coolies may be engaged.

Of these three systems the pannai system is in every way the best and the varam system the worst. Wherever it is not possible to manage the lands under Pannai system, as in the case of big Mirasdars, the best thing would be to let the lands on long leases of not less than 10 years' running. It is only then that the lessee will have some interest in improving the land, by manuring, levelling etc. and it is not too much if a law is made that the lessor should meet a portion of all permanent improvements effected. Allowing a percentage of the profits to the land agents would create more interest in them in improving the cultivation.

Methods of cultivation:—Dry ploughing which is supposed to be good in other places is supposed to be harmful in this district, except in the case of nurseries. Puddling of wet lands, such as is done now, is only in name. "Good ploughing gives better out-turn than bad ploughing", holds equally good in the case of wet lands as in dry lands. The light iron ploughs, such as are manufactured by Burns and Massey Companies could be well worked by a pair of ordinary animals, and they would do more than twice as much work as the country ploughs. It is a favourite argument with some that the Tanjore soil does not require any ploughing and that the puny cattle are quite sufficient. These arguments have no meaning, as good cultivators keep better cattle. Two pairs of strong animals can do as much work or even more than 3 pairs of these creatures and it would not cost more to feed a less number of better animals. These would be useful for all sorts of farm work, such as drawing the levelling board, for cart, mhoite and other works.

The seed rate in the nursery is very much lessened now, and there is scope to lessen it still further. Provided good seed is on hand, and the nursery is well prepared, there is no need to sow one seed more than what is exactly necessary to transplant an acre. For getting good seedlings, the land must be ploughed as often as possible, and a large quantity of manure applied. Sheep penning is very good and, in the case of wet nurseries, leaf at 5 to 6 cart loads would serve the purpose. Castor cake is also found to be very useful.

Rain-fed paddy is sown broadcast in the non-deltaic parts of this district. The absence of timely showers makes it difficult to sow the whole area in the proper season by broadcasting. The introduction of drill system in these parts may prove useful.

The use of the levelling board for levelling lands is almost unknown in this district. Kulivettu is done in summer and the depressions caused by this are made up by the use of mammaties. The use of the levelling board would bring about the same effect more effectively and at a less cost.

On account of the scarcity of labour the planting is prolonged so long, that the last planted seedlings get destroyed by the heavy rains that follow, and the crop invariably suffers for want of water at the latter stage. A man and a woman and one pair of cattle for 6.67 acres is the rule in this district. The man does ploughing and supplies the seedlings, while the woman has to do only planting work. It takes about 2½ months for completing the planting of a man's holding. The season for planting is not so long and as such it is missed in most cases during the latter plantings. Why not then sow a portion of the area broadcast? The less yield obtained by this method would be more than made up by the late planting and its failures. Broadcasting is cheaper. More than an acre can well be sown by one man while 12 to 15 women and more than 5 men are necessary for pulling seedlings, transporting and planting the same area. If the extra saving effected by this method be used for manuring, it is quite possible to get better yields than by transplanting.

The system of planting singles is generally coming into vogue. At any rate the ryots use far less number of seedlings in each hole now than they were using before.

Paddy is harvested when the ears are completely ripe. The harvested produce is bundled, carried to the thrashing floor and thrashed on the same day. Thus harvesting is prolonged for want of sufficient labour. The system which is adopted in Nellore of harvesting the crop and stacking the sheaves in the fields themselves and thrashing leisurely would save nearly 1/3 of the labour, and even more if women are engaged; thus the area may be finished in a shorter time with the available labour. The sheaves may be thrashed leisurely in summer after all the farm work is completed.

Manure:—The small amount of cattle manure is only sufficient for the nurseries, dry lands, if any, and for kuruvai crop. The growing of green leaves on the fields has succeeded in several parts of the district, and there is some difficulty in places where the soil is very stiff, as it cracks much and exposes the roots of plants which wither soon. Growing field gram is a common practice throughout the

district in all soils. Daincha is a quick grower and, if sown under similar conditions and with a thick seed rate, would grow to a height of more than 2 feet before the soil cracks badly and this may be cut, dried and preserved for trampling later on. Green manure cannot be grown in this district, as in others, by irrigating the land, as the land is spoiled and the paddy crop fails. Cattle tresspass, is one of the causes which prevent people from growing green manure crops on their lands. This is due to want of union among the villagers who can easily join together and sow a green manure crop in one portion of the village where cattle tresspass must be absolutely prohibited, while the rest of the village may be used for the grazing of cattle.

The next point is the utilisation of all the waste lands, such as the bunds of rivers, channels and fields and any other place, where no crop is growing. Every weed should be collected, whenever there is no work for the coolies, stored in pits and allowed to rot. This will provide an excellent manure and would go a great way. The dry leaves of trees and topes should also be similarly utilised.

The soil survey of the Tanjore District shows an extreme poverty of phosphatic ingredient in the soil and this has to be replenished. Fish manure is found to give very good results as well as superphosphate, though the relative values of each have not yet been found out for this district. Other phosphatic manures, such as bone-meal and mineral phosphate, though slowly available, would add much to the fertility of the soil. The value of bone as manure is very little known to the ryots. It is even profitable to crush the bone, rot it with lime and urine along with yard manure and apply to the soil.

There is the question of individual manuring. The coolies have not much work after planting. Why not engage them in applying a handful of well-rotten manure, cake, fish-manure or others to each plant after the crop is established? This would certainly pay; for this, the seedlings may be planted for convenience in rows and even further apart than usual. In the case of Ottadam, a 2nd doze of cake or other manure would greatly increase the yield; at least it is worth a trial.

Big bunds between the fields is a characteristic of this district. Black and red gram are grown along the bunds which give some yield. The sowing of a thick line of daincha all round the bunds would give some leaf. It would also form a very thick fence which would prevent cattle tresspass and would even provide sufficient fuel subsequently.

Another feature of this district is that a big land-holder owning hundreds of acres as well as the poor ryot owning a few acres have got their wet lands scattered in several places, a cent here, 10 cents there, an acre in a third place and so on. A lack of foresight in the subdivision of lands by the members of a family is the cause of all this. A system of parivarthanai, or mutual exchange, is going on but not to the desired extent. It is not impossible in the case of interested ryots to elect a panchayat of honest villagers to take the yields of lands to be exchanged for several years, and arrive at certain data to bring about the exchange. There are great possibilities of improvement by consolidating the holdings. Very little land is wasted, labour is concentrated and better supervised. It will also help in enclosing the holdings by strong fences which would prevent indiscriminate grazing and breeding of all cattle.

The importance of roads to wet lands cannot be overestimated. Generally the field bunds are very big, 4 or 5 of which would together form a good cartroad. Such roads to wet lands would be an invaluable improvement. Space is not lost, as both sides can be planted with timber trees or cocoanuts which would give a very good return. All the produce can be very quickly transported cheaply and the ryot need not wait for the fields to dry to cut across them for removing the produce for sale or for storage. The transport of manure for 2nd crop, carting seedlings, grain and straw, and, in short, all agricultural necessities to and from the farm house will be effected very quickly, easily and at a less cost.

The wet lands of this district depend entirely upon the floods of the Cauvery for irrigation. Any sudden stoppage in a flow, such as frequently occur, leaves the ryot in a most helpless condition, though

there is enough water available at a short depth of 5 to 10 feet below ground level. A good well would not cost more than 100 Rupees, while in many cases it can be had for half to $\frac{2}{3}$ of the sum. A well like this fitted with a mhoote would be of great help in cases where one or two irrigations would save a crop. Improvement in well sinking would also bring about the introduction of sugar cane in wet lands in rotation with paddy. In some parts reed cane is grown without the aid of wells. But it is not so very profitable. The introduction of better varieties of cane, like the Mauritius variety, would bring better profits. A great extent of lands are not, under the present conditions of irrigation, free from heavy floods, at one part of the season or other, due to uncontrollable floods in the rivers. And if the Government's intentions about the Bhavani Reservoir are given effect to, there will be seen a variety of crops and even paddy grown in almost all seasons. The wells would help in raising an early nursery.

The scarcity of labour during the busy seasons makes the ryot eager to use some other power for finishing the work. A harvesting machine for paddy is necessary. Calculating roughly, it takes from 70 to 90 men to harvest, bundle and thrash one veli of land of which the usual available labour is a man and his wife, the latter of which rarely takes part in the work except for cleaning the grains and sweeping the thrashing floor. For a well-to-do Mirasdar, it takes more than 2½ months to finish his harvest which, if plenty of labour is available, will be finished in 30 days. Although several varieties of different age are planted in different seasons, they all come to maturity nearly together within a period of 15 to 20 days. The most important thing is to get the crop off the ground in season which takes more than half the labour. Machine power to do the cutting may be used and the men and women will be engaged in bundling and thrashing. A good machine with trained coolies and 2 pairs of cattle would be able to cut at least 5 acres a day. The Narbada Reaper of the Manganallur Farm whose work was very eagerly watched by people near and afar, costs only Rs. 250. 2 pairs of cattle and 2 men, with 4 women to collect the sheaves and cut the outskirts, will finish the area which would otherwise require more than 30 men. No need to charge for the animals

which would otherwise be idly fed. But there are certain drawbacks to be overcome which would be done easily if the expert mechanic visits the spot and sees to the working of the machine. That is, the machine must be able to handle a crop that is badly lodged, as paddy very often does when it ripens. I am sure it is no great thing for engineers who have discovered machines to navigate air to solve this small problem. Any mechanism attached to the machine which would raise the crop and offer it to the cutting apparatus would solve the trouble. The use of roads to wet lands has already been dealt with as also the importance of keeping good pairs of cattle which would do all sorts of farm work. People have also got to understand something of mechanism to repair or adjust the parts, which is not a very great thing. There have sprung up, in all towns and in important villages, intelligent artisans who would execute repairs very satisfactorily.

The addition of a thrashing machine to thrash the produce and a winnowing machine to clean the grains and even a grading machine are improvements which would be taken up by people gradually and at no distant date. The springing up of mills everywhere in the district has created some demand for a cleaner stuff, and the more uniform the size of the grains, the less is the waste in hulling by machine power. This can be done at no great cost by the grading machine.

The value of pure and good seed is recognized by ryots, but much trouble is not taken to have a rigid selection of seed for the next season. The ryots are too idle to improve upon their present system of selection. But it is not impossible, by means of co-operation of the villagers, to have pure and good seed supplied to every one from the best crop of the village. The work of rigid plant selection and improvement of strains is the work of the department which must be extended by demonstration and special seed farms on lines similar to those adopted for cotton improvement in the Tinnevely district. The introduction of new varieties which promise better yields must also be taken on hand. But there are already a host of varieties in this

district which could well be improved before introducing others from outside.

The causes of insect pests, the methods of their spread and simple remedies for them are things of which the ryots have no idea and their education upon these elementary principles would be of much use in modifying the evils, such as by the co-operation of the villagers in using bags for grass hoppers and bugs and also in the use of light traps for stemborers and other similar remedies.

The trial and introduction of improvements in Government farms is the first step. These and other improvements of recognized merits must be carried out in the estates under the Court of Wards, which would form centres from which they would extend in all directions. For efficient work and real improvement, it is highly beneficial to have the staff of such estates manned by men with good agricultural experience and knowledge of scientific agriculture.

The importance of co-operation among the villagers and the vast scope for improvement by the starting of co-operative agricultural societies in every village can never be overestimated. Rapid progress is being made with the efforts of the co-operative department. Still their energies are directed to banking and credit side and once people have understood the importance of this movement and have also learnt the advantages of prompt repayment and business methods, co-operation in agriculture is an easy step. Co-operation will facilitate the rapid extension of the many possible improvements suggested above.

***The Madras Agricultural Students' Union.**

The report read by the Secretary covers the ground of the working of the Union during the last year. I thought it necessary to bring into prominence the principles on which the Union was brought into

* Being summary of paper read by Mr. M. R. Ramaswami Sivan, B. A., Dip. Agri., at the last Agricultural Conference held in July 1914.

being, especially as there is a tendency for several members to think that the 'tamasha' of the College Day and Sports and the holding of the Conference are the only events for which the Union is responsible. I had the honour and privilege of being associated with this Union from its very inception and I have contributed some thing, ever so little, towards the evolution and working of the Union. I know the bright side of the Union and I also know its failings and I propose to review the work so far done, then point out where we have not done very well and why we have not done well and lastly throw out some suggestions for the expansion of our work.

The objects of the Union are :—

- (1) To encourage an *esprit de corps* among its members.
- (2) To exchange opinions and experiences in matters agricultural and to make a record of the same.
- (3) To act, as far as possible, as a bureau for procuring employment to members of the Union.

The first object requires that we should, in the first instance, create an *esprit de corps* and secondly to maintain it. As Sir John Atkinson said in his presidential address of 1912, we cannot have an *esprit de corps* unless we have a common cause to serve; and that cause has apparently for its foundation an attachment to the *Alma Mater*. We expect, therefore, everyone who has passed out of this college and of everyone directly or indirectly connected with the institution to take a pleasure and a pride in owing the college as his mother—a mother who has given him milk of knowledge or the means of subsistence. One often hears the remark "What has the college done for me that I should have a loving attachment to it?" Such a remark comes mostly from some of my fellow students of Saidapet who, for want of opportunities or openings for an agricultural line in those days, have as a necessity been obliged to seek out their livelihood as Pleaders, Salt Officers or Local Fund Overseers. I had, in my own case, nearly dropped into that category. Saidapet students were often obliged to take to professions other than agriculture, only for want of

openings and opportunities. The Government of the time helped in the straying away of these men from agricultural pursuits by declaring the Diploma in Agriculture as equivalent to B. A., for purposes of appearing for the Revenue and Criminal Tests on one side and by circulating passed lists of students to the District Collectors for appointments. The grant of stipends and the shunting of Revenue Department clerks for training at an advanced age were also responsible. I, therefore, request you not to condemn such men for not taking up the professions for which they were trained. The wonder is that, in spite of these disadvantages, there have been several men who have taken up to agriculture as a profession.

Now every one trained at either of these colleges, whether he is in the profession or not, whether he was a casual or a full course student, should feel his bounden duty to feel and to maintain a love for the college. This can be done much better in a corporate capacity; and the Union has been organized to fulfil that function. A sense of solidarity and brotherhood must be felt by all, high-placed or low-placed, old or young, full of experiences or recently recruited. Only then can we say that we have created an *esprit de corps*. To maintain it requires constant work, done day after day and year after year. The annual functions of the College Day, Sports and Conference have to be understood in the spirit that they are the means of bringing together past and present students and others who are interested in our work. The daily work entails almost completely on the resident members of the Committee, and such work cannot be done unless officers who have little leisure beyond their official duties are prepared to make some sacrifice—sacrifice, especially, of time. The Working Committee, after all, can do little if they are not helped and backed up by the mofussil members of the Union. The purpose of my paper will be served if, at the election of the office bearers to take place this evening, officers will offer themselves for work like Municipal Councillors, rather than wait for offices being offered to them. For I am of opinion that a person of mediocre abilities who is willing can do more work than another who may be brilliant in his own way but unwilling to exert.

The work of the Union also consists in recording and circulating opinions and experiences in matters agricultural and for this purpose the journal was brought into existence. As the officially recognised editor of this journal, I have always felt that the journal is rather scanty with regard to the publication of practical agricultural experiences. It fulfils the function of "college news," in a way though belated. In order that we may have such practical information we require contributions from all those who are directly connected with practical work in the department or outside. Even a full time editor requires help from outside contributors and I am constrained to remark that, except in a few cases, little response was received in the shape of contributions in spite of general and special requests. It cannot be said that there is a paucity of men who can contribute useful matter to the journal. I had the privilege of judging the essays for the Munagala prize and I found several useful items of information based upon observations and practical experience in them. Writing an article probably requires a greater thought and some literary taste. But we, as agriculturists, want the matter and may even ignore the manner and style. Enquiries made of a labourer in the field have to be sifted, gleaned, put in accurate terms and posted. All this means labour and trouble, and, without the bestowal of much trouble and labour, no useful work was ever done in this world and a journal worthy of this institution cannot be put forth; and the help of old students and present students, of Zemindars and landholders, and, last but not least, of the heads of the different scientific sections, is urgently required and earnestly solicited.

With regard to the third object of the Union, we have done practically nil and probably we are not likely to do much. Were it not for the references made from time to time by the Principal or by the Director, we could not have done even the very little we have done. I am certain I am voicing the opinions of the passed students of this college that they are much indebted and feel grateful to the Director of Agriculture for the liberal scale in which he proposes to reorganise the Department. I have sketched the nature of Zemindari service in my own case. Court of Wards' service is a little better but not much more so. A passed man prefers to enter the Madras Agricultural

Department even on an initial small salary to taking up private service, because permanency of service, chance of being appreciated and prospects of advancement, from time to time and from grade to grade, are assured in the former case.

While we look to the Agricultural department in Madras for most of the appointments for the members of the Union, a small number will take up private farming; but there will be always a certain number who will go in for service under Zemindars, Court of Wards and Landholders; and we would request them to consider the disabilities of service under them when they offer appointments. If one cannot pay well, one cannot get a good man; and an inefficient man will have no power of initiative to stem over difficulties of all kinds which are sure to be met with in pioneer work, especially in Zemindari tracts. This word "pioneer" brings in, to my mind, that we are meant by Providence to do pioneer work. The population is increasing the area of cultivation is limited and there is little or no land available on darkhast. Therefore, more food material must be produced out of the land by intensive cultivation and this work devolves on us. We may experiment and may either fail or succeed; but we must succeed in the end. We may not be able to reap the harvest of all our labours. Men who plant trees do not all hope to eat the fruit thereof. The trees have been planted more for the descendants. Similarly the work that we do is pioneer work or preparing the way; and we, the Members of the Madras Agricultural Students' Union, consisting of present and past students of this college, with the cordial help of the scientific experts on one side and the enlightened Zemindars on the other, associated with us as honorary members, certainly form a nucleus of an association which can do this pioneer work in an efficient manner.

With regard to the expansion of our work which is bound to occur sooner or later, we may bestow some attention. First comes the necessity of converting the quarterly into one of a shorter interval, say monthly. A monthly journal requires more constant application of work than a quarterly; but there are several advantages. News can be supplied fresh. The journal may not contain as many pages as the

present one; say 3 or 4 forms instead of the present 8 forms. A small printing office, such as is available at Coimbatore, may be able to undertake it and print more punctually and promptly than we had the fortune so far. The cost of production and distribution will be greater but not proportionately more so. There will be a saving of half the postage as the Postmaster-General grants concession in the case of monthly journals, which is not extended to quarterlies. There may be an improvement in paper and general get up of the journal. Copies may be sold at Rs. 3 per annum. I have made calculations and find that 500 subscribers paying at the rate of Rs. 3/- will make it self-supporting. All the members of the Union,—and, according to the Secretary's report, there are over 260 members,—take a copy and pay for it, including the Editor and Manager. There are nearly 200 other subscribers already on the list. One of the first means suggested to the Committee of the Union was to ask for Government patronage, by requesting them to subscribe for a copy for each Revenue officer of and above the rank of a Tahsildar and for each Educational Institution above the grade of High School. The journal will certainly be useful to them. But have we made the journal as good as it should be? Have we tried all our own resources? May we not, each of us, members of the Union,—and we are over 260—promise to secure one additional subscriber, on the average, by taking some trouble? When we have done all we can do, it will be time enough to ask for Government or other help. We must make the journal generally more interesting with a greater variety of matter, and the first step is, in my opinion, the conversion of a quarterly journal of 8 forms into a monthly of 3 or 4 forms.

As the President of the Union remarked during the last Conference, the Year Book of 1911 blossomed into a quarterly last year, and I hope, it will ripen into the fruit of a monthly journal this year.

With regard to the procuring of appointments for old students we have acted hitherto only as a forwarding agency. Can we do nothing more? Of course we cannot create appointments, except one or two very rich members here and there. But can we not

help in equipping a promising and distinguished student occasionally, with the means of acquiring a superior education, say, in a foreign country or a Post-graduate Education in India. In addition to the greater knowledge possessed by a man trained in a foreign University, he has a broader outlook of life and his services will be more largely in demand in the newly organized and constantly expanding Departments of Agriculture in India. The help that I have in view may be similar to the scholarships awarded by the Indian officers' Association, Madras. A certain small percentage, say half to one cent., of the salary is levied on willing members drawing a certain minimum salary and the collections are lent to a promising student. His life is insured for the amount he borrows and the premium is paid during the years of his absence from India. The policy is assigned to the Association and a stipulation is made in the agreement that the loan will be repaid at stated instalments after taking up service and that the policy will be reassigned on the payment of premia advanced by the Association. This entails no loss to the Association, except the loss of interest. Several brilliant men of the Madras University have benefited by these scholarships and have got suitable appointments in the different services. Being a smaller number of officials and receiving comparatively smaller salaries, we, the Members of the Madras Agricultural Students' Union, may not be able to get as much money as will be necessary to meet the expenses of education of a man in a foreign country every year. But we do not apparently want it; we do not have berths for such a large number of men. If we find means to send a man, say, once in five years and probably, even then, only to meet a portion of the expenses, it will be more than ample. And all the time we are helping him, we should remember that, after all, we have only given him a loan and, in future years, the repayment of these loans will help the Union in meeting a larger demand and with larger amounts.

The affairs of the Union are in the hands of a Council consisting a President (the Principal ex-officio), 4 Vice Presidents and 12 members,—3 Vice Presidents and 7 members being from the mofussil. The function of this Council, Advisory Board as it were, is to direct the work of the resident Working Committee and help the latter in several ways. May we appeal to their sense of responsibility by asking them to enlist new members to the Union, supply correct addresses of old students, obtain fresh subscribers to the journal and contribute matter regularly to the same. The appeal is made to all the members, but more is expected from the Council members.

I have also the wish that membership in the Union should grow to be, in course of time, a passport and introduction from one part of the country to the other. For instance, if a member in one locality wants urgently some seeds, plants or agricultural information from another locality where a member of the Union may be living, he may apply to that member and get what he wants even quicker than through the Department. Again, if a member should happen to be touring, on business or for pleasure, in a new locality, his membership of the Union should be a sufficient inducement to him to call on a member of the Union who may be living in the place, and exchange ideas with him, for each other's benefit.

I am also suggesting that old students of this college who are living in convenient proximity, but cannot attend the College Day at Coimbatore, should meet and celebrate the Day in their own place, thus showing that, on that festive day, they are in spirit with us here.

The Union is only 4 years old. Based on the traditions of the old Saidapet College and of this newly expanding Coimbatore College, the foundations of this Institution have been well laid and we will all help in erecting a superstructure worthy of our

Alma mater whose approbation we will all care for, expressed in the words "well done, my boys".

The Cultivation of the Apple.*

The apple is one of the most important staple fruits of the world. The plant is grown in sub-tropical and temperate regions throughout Europe, United States, Australia and, to a less extent, in India. The plant could be grown here at elevations between 3,000 and 7,000 feet above sea level, with a rainfall of 30 to 50 inches.

The land selected for the garden should fulfil all the conditions necessary for any good cultivation with facilities for irrigation and drainage. It is certainly better if the site is situated near a town or any commercial place, so that marketing the fruits may be easy. Red loamy soil with a little lime in it overlying a bed of gravel or laterite would suit apple very well. It is well if the land has a slope, and the slope faces the morning sun. It should be protected from wind, lest the young plants suffer and the old plants drop their flowers.

In the way of preparing the soil there is nothing particularly to be done for cultivating apples. They require no shade trees. The land should be cleared of all the trees and their roots removed. If the area is small it may be dug up, or the land may be ploughed deep and taken out. In the first year a leguminous crop may be grown with advantage as this will keep down the weeds and besides this the nature of the crop will give us an idea of the fertility of the soil. While this preliminary crop stands, odd works, like trenching and fencing, may be got through.

* Being summary of paper read by Mr. H. G. Javarayya, L. Ag., at the last Agricultural Conference held in July 1914.

The plant is propagated in many ways - by seeds, by cuttings, by layerings and by suckers, the last being the commonest here. The suckers are taken out and potted or planted in beds in the rainy season. These will form the future stocks for grafting. In some gardens where no systematic planting is done the suckers are permanently planted in the garden itself where they are grafted. The stocks should be 2 to 3 ft. high and $\frac{1}{2}$ to $\frac{3}{4}$ of an inch in thickness. There are certain good varieties like the 'Northern Spy' which are disease-resistant. Such varieties should be selected. The selection of scion is also important. It should be taken from a tree having a good history. Grafting is done in the month of February and March when there is free circulation of sap in the plants. The process of grafting done in Bangalore is that of tongue grafting. It is important that the stock and the scion are of one size. They are both cut similarly with a clean slope, and over the slope of the cut they are split so as to form tongues. They are then put together face to face and the tongue of the scion pushed into the slit in the stock. The union is perfect. Budding is not done here. Imported plants are budded. Budded plants have two advantages over grafted ones. One is that the suckers in the former stock can be easily distinguished and the other is that in grafted plants there are chances of the scion separating from the stock either by bad handling or by the force of wind. Care should be taken in the selection of plants, as the quality of the fruit depends upon that of the tree. Plants that are precocious and show unusually quick growth should be avoided and plants that have stunted growth should also be refused. Plants having a steady and healthy growth should be selected. Again plants in which the union of the stock and the scion is not good, should be refused. The gardeners in Bangalore always use the local grafts. They are comparatively cheaper than those imported, their price being 8 as while that of the imported is 1-4-0 to 1-8-0. each. Of the latter class that do well there, some are Ribstin

peppin, Worcester permain, Peas-goods Nonsuch, Cox's orange peppin and Rome beauty. Among these plants, there are two classes,—the Standard and the Dwarf. The standard plants grow tall and yield more, but take a longer time to fruit. The dwarf plant is short and begins to bear in 3 years. The distance at which the plants are planted apart varies according to the character of the plant and the nature of the soil, though the latter is not so important in intensive cultivation. In the Tiglar's gardens at Bangalore, the plants are put very close—from 5 to 10 feet apart—the reason being that the plants keep straight as they are not pruned and as such do not occupy much space. In Ootacamund they are planted 15 to 20 feet apart. The imported plants require to be put at least 15 feet from each other so that there may be room for air and light to enter in. The common systems of planting are the square or the quincunx or triangular ones. The latter way is adopted when the permanent plants are slow growing. The centre of the square is planted with a quick growing small tree which may be removed when the large trees attain their full size. The pits may be 3 ft. by 3 ft. by 3 ft. Where drainage is not very satisfactory pieces of bricks and small stones may be put at the bottom of the pits. While planting some of the surface soil should be put in a heap in the pit, so that the roots of the plant might comfortably place themselves. After the plant is placed, the surface soil should be thrown over the roots and well pressed. Then nearly the rest of the pit should be filled with the remaining soil and water poured in so that the soil may settle and then the pit may be completely filled. Some say that it is not good to mix any manure while planting but as the plants should not be disturbed for some time, I think some well rotted farmyard manure may be mixed with the soil along with some sand. The usual precautions must be taken when planting and there should be a hollow round the plant, slightly away from the stem, for water to stand. A small number of good waterings

followed by stirring is much better than a large number of poor sprinklings. The plants are planted at the commencement of rains when the rainfall is light, but in places where there is heavy rain, planting is done in the latter period of the rainy season. Apple belongs to the class of the deciduous plants, that is, it has a dormant or resting stage in winter when it does not need much water. During hot weather, the plants should be watered twice a week.

In the first two years crops of vegetables may be raised. This will help in making the soil mellow and checking the weeds and also pay us the cost of the expenditure for the year. The water and the manure used for these crops will be useful for the apples as well.

Apple requires manuring every year. For the growth of the plant and the development of fruits a large quantity of the plant food is removed from the soil. It is said that five bushels of fruits take away eleven pounds of nitrogen, one pound of phosphoric acid and sixteen pounds of potash; besides this the plant itself requires a quantity of all those. This gives us an idea of the requirements of the plant. In Bangalore 15 to 20 tons of farm yard manure are applied per acre. They also use night soil with great effect; artificial manures can also be advantageously used. Nitrogen helps the plant to grow robust. Its effect is particularly seen on the leaf. Where there is plenty of Nitrogen, we see good foliage with dark green colour. Nitrogen also makes the fruits heavy and juicy. Excess of Nitrogen produces rank growth which will be followed by 'die-back' disease. Phosphoric acid has influence on the whole of the plant and, it is said, on the growth of flowers specially. Potash influences the general health of the tree and its productiveness. Its particular effect is on the character, colour, sweetness and flavour of the fruit. The manures that are commonly used are sulphate of ammonia, superphosphate, bone meal and sulphate of potash. We have tried the mixture of sulphate of ammonia, superphosphate and sulphate of potash in an average soil in the proportion of 2 : 3 : 4. The manures

are finely mixed with an equal quantity of very fine red soil and 4 to 8 pounds are applied to each plant according to its age and size.

The next important operation is the pruning of the plants. All that the local gardeners do is to simply strip off all the leaves except a few at the top. This they do twice a year, in February and September, to induce flower buds. It is leaf-pruning that they do and they do not believe in the pruning of branches. But branch pruning is advantageous and, if carefully done will, at the end of 2 years, give a well balanced shapely tree with ten or twelve branches and with fruits' spurs from the little branches which are pinched back. Out of the shoots that come from the buds below, three or four are kept at even directions. Any shoot from the stock will have to go. If any of the shoots grow unusually long it should be pinched and kept back. The next year these main branches are again pruned to a foot length and the third year again they are pruned regularly as before. Subsequent pruning comprises in removing dead wood and branches that rub and cross each other. Usually, for a bush plant the vase shape is a convenient one. The branches will be low and the stem will not be exposed to the sun. evaporation on the ground will be less on account of shade, and it will be easy for picking, spraying and general handling of the plant. With the weight of the fruits the branches get open to allow light and air and on the whole the plant will be stable.

Another point to be borne in mind while pruning is that the branches should be cut to an outer bud generally, and to a side bud in particular cases, where gaps have to be filled. If, on the other hand, it is cut to an inner bud the shoot gets to grow towards the centre of the plant which should not be allowed. The trunk should be kept clean to 2 or 3 feet in the case of bush plants. A word about pruning fruits. When we want a smaller number of large fruits, instead of a larger number of small fruits, then as many only as we want are allowed to go on, the rest being taken out. Till the 3rd year the plant should not be allowed to fruit as that will exhaust the

life of the plant. The trees flower about the month of March and September. The practice is to take two crops, but it is considered that in that case plants get weaker. While talking about pruning, I might say how the fruit bud looks different from a leaf-bud. Leaf buds are long and pointed. They produce either leaves or branches; whereas fruit buds are short and round. The scaly leaves that cover them are slightly broader. Leaf buds may be forced into fruit buds by artificial disturbance.

In some cases where the plant grows too much into wood and leaf without growing fruit buds, slight root pruning is advisable. This is done by merely digging a trench round and away from the stem of the tree and cutting a few roots. I might say that a secateur or pruning shear is very useful for pruning and one that has a well curved upper blade which ensures a "drawing" cut is to be preferred to one that produces a "crushing" cut as in the case of the common scissors.

As I said before, in the first and second year, a crop of vegetables may be raised but later on some leguminous crops may be grown. This will keep the land cool and free from weeds and will also improve the soil. The rest of the plant during the period of dormancy in winter should not be disturbed by any cultivation.

Now about the produce. Fruits may be kept afresh for about a fortnight. A good system of packing is to put them in cases which have partitions that will hold just a fruit. The fruits should be covered with thin tissue paper and the boxes should be ventilated.

Apples are often attacked by diseases and fall a prey to enemies. Entomological and Mycological details I will omit as most of us are not interested. We have stem borers, bugs, leaf eating caterpillars, bark eating hoppers, aphids and red spiders. Stem borers should be pricked with a thin wire and some neem oil poured into the hole. For sucking insects kerosine emulsion or resin wash are effective remedies. These insecticides have become so popular that I need not describe the methods of preparation. Hoppers that are found on the

stems and branches on small trees could be cut into two with a sharp knife. For leaf eating caterpillars hand-picking should be done before they spread. Besides insect pests we have fungus pests also, apple blight and black spot. Our treatment of Bordeaux mixture is too well known to require description. If the plant is bad beyond remedy, it should be cut, removed and burnt. Discretion must be used in applying insecticides on the fruits as they are poisonous. As fruits ripen, the spray fluid should be diluted. No spraying should be done in the final stage of the fruits.

While concluding, I might say that the question whether the improved system or the local system of cultivation is profitable, cannot be answered at once. While deciding this question, one of the chief points for consideration is the nature of the demand for the fruits at the market. We see that the number of men who use these fruits is increasing. We should know whether they care for quantity of an indifferent sort or for quality *i.e.* the size, colour, and flavour of the fruits. Poor people here do not buy apples; it is only the rich class who generally care for the fruit. In these circumstances improved system of cultivation is certain to pay in the course of a few years, though not at the start of the plantation.

Mr. Javarayya also gave details of cultivation charges and a balance sheet showing that, at the end of 20 years, a profit of Rs. 700/- per acre may be obtained in favourable cases.

Notes.

We offer our hearty congratulations to Mr. A. Seturama Aiyar, Dip. Agri., of Needamangalam on the title of Rao Sahib conferred on him on the occasion of H. M. the King Emperor's birthday. Passing out of the Saidapet Agricultural College nearly 20 years ago, with a good Diploma, Rao Sahib Seturama Aiyar chose to be a gentleman farmer and settled at Needamangalam. He took prominent part in all kinds of public life in the district during these years, but he was more prominently known for his enthusiastic honorary work in the

Cooperative line. He is one of the ardent members of the Students Union and we are glad that one more of its members—last year it was Rao Sahib A Rama Rao—has been honoured.

A correction.—With regard to the note on the late Rao Bahadur C. K. Subba Rao's water lift, we are informed by T. S. V. that the lift which he saw installed at Palur was the Persian Wheel and not the See-Saw Water lift, although the late Mr. Subba Rao invented the latter.

The use of fish as cattle food has a novel sound, but it appears to be a common practice in various parts of the world. In Shetland and Iceland dry salt fish is fed to cattle, sheep and even to horses. So long ago as 1853, Sir John Lawes carried out experiments at Rothampsted on the feeding of pigs with dry Newfoundland cod fish. He found that the fish-fed pigs were fat and well grown, and there was a good proportionate increase to the food consumed. Although fish does not compare favourably with groundnuts so far as fattening value is concerned, it is suggested that on the coast a considerable saving might be effected by its use *C. T. From The Agricultural News.* (Fish was tried as cattle food on the Central Farm last year, with some success.—Editor.)

The trouble of getting a sufficiency of jute fabric has led the British Government to adopt coarse cotton cloth for the making of sand bags. A German Journal shows that the enemy is using "Stranfa"—a product of straw in place of jute for forage bags etc. The substitute is only a partly efficient one. Now, when the belligerents are on the lookout for substitutes, it is a strange thing to note in the May issue of the Indian Trade Journal that there is a tremendous decrease in the export trade in Indian Jute and gunny bags, including Bimlipatam jute (gogu bags) which are cheaper than coarse cotton bags and even better for the use. *K. C. J. (from the Journal of the Royal Society of Arts.)*

In Lalgudi division of the Trichinopoly Taluk, a practice obtains of sowing Indigo about 10 days before the harvest of paddy in the standing crop in the months of Feb.-March. The indigo crop is allowed to grow till August. In the beginning of June, when freshes are received in the river, a cutting is taken 4 months after sowing. In this cutting, seeds are also obtained. The cut stems are allowed to grow by an irrigation and the second cutting is taken in August when the crop is finally removed and paddy transplanted. These are single crop wet lands. In the first cutting the plants after being cut are shaken and slightly beaten to get rid of the leaves which are dried. The dried leaves are beaten with sticks and converted into a more or less powdery form and packed in gunnies. The second cutting also undergoes similar treatment and the dried leaves are packed in gunnies. Dye is extracted from this dried leaf by placing it in a big earthenware pot with water and allowing it to soak for about 16 hours. This water is passed through holes in the pot to another pot below. Here the water is churned and lime water added when the dye stuff settles down and clean water stands above. The dye stuff is boiled under fire and small round cakes are made by hand. In some cases, the stuff is powdery when it is called "Avul Sarakku" or assumes the form of beaten rice. The extraction of dye is done at the leisure of the ryot when he has no work.—W. R.

Estate Notes.

Our readers will be glad to know that Mr. J. Chelvaranga Raju, Chief Assistant to the Principal has been appointed Assistant Director of Agriculture and placed in charge of the Central Division, with Head quarters at St. Thomas Mount. We notice that the appointment is on the newly sanctioned scale of Rs. 200—12½—400; and we await further appointments on the new scales to be announced early. Mr. J. C. Raju has had unique experience in agricultural matters and is a man of tact and resources. We dare say that he will justify the selection and spare no pains to show that an Indian member of the staff, not trained out of India, can, under certain circumstances, fulfil

the duties of an executive officer in popularising agricultural work in the country. We wish him all success.

The two year courses at the college seem to be quite popular. There was a large number of applicants for admission. About 70 of these applicants were sent for and examined in the first week of June in simple essaywriting, handwriting, dictation and arithmetic and in practical field work. A preliminary selection of 48 students was made; and it is possible that about half a dozen may be sent away after a fortnight's probation, if they do not take kindly to the kind of work to be done at this college. The class, as a whole, appears to be a good one and is representative of all districts and castes.

A Night School for the labourers on the Farm has been opened on the Farm, the Principal being the ardent spirit of the Social Service movement. Messrs. K. Ramiah, K. Unni Krishna Menon and A. K. Subramania Aiyar are the first volunteer teachers, and it is worthy of note that all the three are members of the newly started Coimbatore Hindu Social Reform Association.

The Officers' Club.

The members of the Club gave a successful send off to Mr. J. C. Raju, one of its Life members, before he left the station to join his new appointment.

At the request of the members of the Club, Mr. C. V. Raman, M. A., the distinguished scientist of Calcutta, who had come here for a day, gave an interesting scientific chat on the lines on which Research work must be undertaken. His main theme was that one should do some scientific work in India before he went to a foreign country, and he cited several examples of successful Bengalis who had distinguished themselves in that manner.

Departmental Notes.

1. Mr. J. Chelvaranga Raju, Chief Asst. to the Principal, to be Assistant Director of Agriculture and placed in charge of the Central Division, vice Mr. Roger Thomas, 3rd Deputy Director, transferred to the Southern Division.
2. Mr. R. Ramaswami Aiyar, Farm Manager, 1st grade, to act for Mr. J. Chelvaranga Raju.
3. Mr. T. V. Rajagopalachari, Dip. Agri., Farm Manager, transferred to Sirvel Farm.
4. Mr. V. Dhanakoti Raju, Dip. Agri. Farm Manager, transferred to Nandyal Farm.
5. Mr. C. Narasinga Raju, L. Ag. to be Asst. Farm Manager on probation and posted to the Samalkota Farm.
6. Mr. S. R. Venkatakrishna Mudaliar, B. A. confirmed as 3rd Assistant in Mycology and It. 50-5-125. from 1st January 1915.
7. Mr. D. Panakala Rao, L. Ag., Asst. Farm Manager, on return from leave, is posted to the Central Farm.
8. Mr. A. J. Wilson, 3rd Lecturer, Veterinary College, Madras, is appointed Veterinary Assistant in this College vice Mr. S. L. D'Silva, permitted to retire from 1st July 1915.

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THE JOURNAL

OF

The Madras Agricultural Students' Union.

Vol. III.

July 1915.

No. 7.

The College Day and Conference.

The functions which have by custom, the present year is the fifth year of the full celebrations, become associated with College Day cater for all classes and affect all the dwellers on the Estate so that each can find some point of interest, and every one can regard it from his own point of view. The athletic student will look forward to it as the opportunity to display his prowess and receive the rewards therefor, the cooks in the Hostel no doubt regard it as a bore since it implies a good deal more work than usual; the Principal worries about the terms of his opening speech and though proud of the College, no doubt heaves a sigh of relief when it is all over; the lazy student hails it as a welcome respite from the monotonous round of his studies.

The celebrations this year followed the usual routine, though to the chagrin of the Andhra students, Telugu found

no place in the Dramatic Performance. There were the usual sports in which the usual students competed, and won the usual prizes. The entries were in nearly every case meagre, and the winners of the prizes could be counted on the fingers of both hands. It is a pity that more do not enter, and specialize for the events in which they think they would have a chance, instead of allowing a few to sweep the board.

The Conference opened in the usual manner on the following morning. With the Hon. Mr. Barber who occupied the chair, were associated on the platform, the Union President Mr. R. Cecil Wood, the Vice Presidents, Mr. D. Ananda Rao and Mr. Vengail Krishnan Nayanar, and the Secretary M. R. Ry. K. Krishnamurthi Rao. The selection of the papers to be read was liberal; in more than one case, it would have been better to have had less paper and more discussion. The Conference was fortunate in having persuaded Mr. Hilson to give them the results of his work on sheep at Hagari, and Mr. Yegnanarayana Aiyar is to be congratulated on his excellent paper on Agricultural Implements. This was amplified later in the day by an all too short magic lantern lecture on the same subject. We are grateful to Mr. Krishnaswami Aiyar for his kind criticism and well-considered advice to take more advantage of the co-operative movement in our District work. A full description of the papers will appear subsequently. Naturally all were not of the same merit, but some failed to attract the audience because, though their preparation had certainly entailed considerable labour, they were merely descriptive and contained no new ideas. They

could thus lead to no discussion, and full advantage was not taken of the gathering of so much agricultural intellect. The Conference will only fulfil a useful object, when it forms a means by which new ideas, new proposals or new work can be put forward and discussed with advantage as much to the reader of the paper as his audience. The informal meeting held on a later date of the District Staff is a most useful adjunct to the College Day functions, and is valuable, because definite proposals based on personal experience, for the removal of difficulties or the improvement of conditions, are brought up and discussed by those whom they concern. The Union officials are to be congratulated on the success they have achieved and the importance which they have managed to confer on the Union. The heading to the description of the Conference, in the *Madras Mail* was printed in type hitherto reserved for the meetings of the Legislative Council, and never granted to the ordinary District Conference—Bravo, the Union.

Mr. S. L. D'Silva:—An appreciation.

Mr. S. L. D'Silva, Veterinary Assistant of the College, retired on 1st July 1915 after a long and meritorious service of over 32 years. Coming from a well known and influential Catholic family of Mangalore, Mr. D'Silva joined the Madras College of Agriculture at Saidapet in 1880 and passed out, after a brilliant career, in 1883. He was not only the best man of his batch, but he obtained marks far above the first man in any batch, before or after him. Soon after passing, he was employed as a Cattle Disease Inspector and, within 2 years, was selected to act for Mr. C. Benson as Deputy Superintendent

of the Saidapet Farm. He joined the teaching staff of the Agricultural College at Saidapet in 1888 and has been connected with the teaching of Veterinary Science and Live Stock from that year until the date of his retirement—a period of 27 years. In addition to teaching, he was the officer in charge of the Veterinary Hospital at Saidapet and latterly at Coimbatore. His fame as a Veterinary physician and surgeon was great, a large number of equine, bovine and canine patients having been sent to him for treatment from all parts of Madras, from the magnates of the city, European and Indian, to the poorest jatkawallah. The Veterinary College in Madras is only 12 or 13 years old, but Mr. D'Silva had made his reputation long ago, so much so that a deputation to the Bombay Veterinary College for training which was then being followed for Senior Veterinary upper subordinates was considered unnecessary for him. The praiseworthy mention made of him year after year in the administration reports during the last 25 years shows that the work which he did was of a high order and was well appreciated by the Heads of Departments.

When Mr. Keess retired from the Principalship of the Saidapet College in 1906, the burden of carrying on the administration of the institution for over 2 years fell on his shoulders as acting Vice Principal. Probably any other person with a lesser foresight might have been glad of this opportunity to be the Head of the Institution, but Mr. D'Silva foresaw that the period of his charge was not a happy one to get through and that, though the teaching staff was the same as before, the College was more or less under a cloud. The Saidapet college was, rightly or wrongly, condemned as having failed in its purposes, and only those who were in that college from 1906 to 1908 could realise the anxiety with which they were daily expecting the orders deciding the fate of that institution and of those who were teaching and who were being taught there. The thanks of these men are due to Mr. Keess who (in 1906) and Mr. Chadwick who (in 1915), in unmistakeable language, have stated that, whatever was the measure of success of that institution according to the verdict of a future administrator, the men who were engaged in teaching and several of their students had done their work honestly and satisfacto-

rily. The institution was eventually ordered to be closed in June 1908; and the services of the staff were transferred to the new Coimbatore College. Mr. D'Silva's health broke down considerably during this period and he had to take a long furlough before joining his duties at Coimbatore. Mr. D'Silva's work, both as a teacher and as a Veterinary practitioner, was highly appreciated by his students, by his superior officers and by the general public, but, owing to a curious run of a number of unfortunate coincidences, we must say that he did not get the good things of the world to the extent that he deserved. Again, having succeeded to the 1st Assistant's place of the Saidapet College in the Provincial Service in the Educational Department on the death of Mr. Krishna Prablm in 1904 and appointed to act as Vice-Principal of the Saidapet college in the Indian Educational Service for over 2 years, he should have retired now, (if only the college was not technically transferred from the Educational Department), under normal conditions, as a gazetted officer on a much higher pay than as a nongazetted officer on Rs. 250. No one could probably be blamed for it, for there was no post available in the new Agricultural Department, carrying a higher salary than Rs. 250 to which Mr. D'Silva could possibly have been appointed. It would have gladdened the hearts of many of his old students if the new Reorganisation Scheme had come a few years earlier and if Mr. D'Silva had been appointed to one of the higher posts. But no. As we said above, it was an unfortunate run of coincidences. All the same, Mr. D'Silva took everything in a philosophical mood. Out of the little he had, he gave freely and unostentatiously to the poor. His old students of 1900 will probably not recognise in the resigned philosopher of 1915 the vein of pleasant humour which they then used to associate with him. Being a good Latin scholar, he used to pour over old classic authors and devote all his leisure hours to the study of religious literature. He was a devout Christian and a pious soul.

Having been associated with Mr. D'Silva for over quarter of a century, first as student and latterly as colleague, we had occasional differences of opinion but we have always found pleasure in yielding to

his wiser counsel. His students have always cherished the highest regard for him and unanimously elected him the resident Vice-President of the students' Union for a number of years until he declined to hold office any longer on the plea that younger men should share the honour. He was one of the promoters of the Union and was largely responsible for its initial working.

Just before taking leave of us, he said that, unlike a large number of his old colleagues who entered service along with him but died in harness, he had been spared by Providence to retire on attaining his 55th year, fairly healthy and strong. If he only cares, he will soon find that owners of animals in Madras have not forgotten him and that his veterinary patients flock to him.

Mr. D'Silva has been fortunate in having as his partner in life, a lady who has been a good counsellor to him all these years. May they live long in their peaceful little retreat in Guindy which they have built on the bank of the river Adyar.

M. R. R. Sivan.

"The Munagala Prize" Essay.

[The economics of an Indian village with special reference to Agriculture, Cooperation and Accounts as at present exist, and how improvements could be brought about, with particular attention to the conditions of a typical village.]

The village of whose economic conditions, I am detailing in the following pages is fairly typical in its agriculture, in the class of its people, and in the general ways of their life of a good portion of Tanjore District. Lying on both sides of the Cauveri, the village of Sarukkai is bounded on the two sides by the rivers Coleroon and Arasalar, the branches of the Cauveri itself. There are thus within a breadth of $1\frac{1}{2}$ miles of this village three important rivers, with a net work of irrigation channels. The village is only two miles from the nearest town of Papanasam, the newly constituted Taluq head-quarters,

a rising town, and an important Railway centre. Still, on account of three big rivers all unbridged between this place and the station, the transport of the products is now only very small, the bulk of the produce being sent up to the more important towns of Tanjore and Kumbakonam on the trunk road. The Govt. is considering the proposals of bridging up these rivers and if this is effected, every bit of produce will have a very ready sale. Similar difficulties are quite common in the Delta tract, the produce in many cases having to be carted a distance of 10 and 15 miles although the Railway Station is within a mile. The whole village of about 750 acres consisting of nearly half wet and half dry land is formed of deposit of rich alluvium, varying in depth from 5 to 20 feet lying on a bed of sand, with an excellent supply of sub soil-water.

The landed classes are mostly Brahmins, though a few non-Brahmins have recently purchased lands. The whole village was divided about 50 years ago into seven divisions, each division belonging to the members of a single family. The heads of these families formed the heptarchy, and on account of their strenuous exertions and cooperation they kept the village in an agricultural superfluity. This set of people have disappeared, and their place has not been properly filled up and there has not been a continuity of the old village organisation. These 50 years have wrought a great change in every Indian village. English education, the prospects of services abroad in various lines of work, and the development of Railways have tended to carry away the promising youngmen from their houses, who in many cases have lost touch with their native village altogether. The management of the lands, and the village organisation are now left entirely under the hands of 2nd rate men, men who have been found useless at school and, no better, as apprentices or clerks in private employ.

The constant division of landed property (production is rather more rapid in the Hindus than other nations) by the members of a joint family according to the Hindu Law of Inheritance, have made the holdings too small in most cases for economic farming. Although this division is "the handiwork of a law made by man, and can be removed by the same means" with great advantage to national welfare, is not

very easy at present, and it has thus to be considered as the greatest drawback to economic holding. This is even further aggravated by the scattered nature of even such small holdings. An average Mirasdar (landholder) of about 15 acres has his lands scattered over at least half a dozen places. He has his single crop wet land in at least 2 places, the double crop lands in another 2 places and his dry and garden lands in 2 more places. Here I do not include his house sites, the topes, nursery beds and various minor pieces. This is due to the division of every type of land into several divisions, to ensure equality in partition, every member requiring a share of such lands which have special facilities such as nearness to the road, head of the irrigation channel and such others. The progress of scattering the holdings in this way is occasionally checked by a sort of mutual exchange of lands (Parivarthana) of the neighbours. Want of confidence, and the lack of fair play in such dealings have often been the cause in preventing the progress of the reverse process. The peculiar feature of a wet land village is that it is a barren tract for about 4 months, from February to June. In June the rivers receive the freshes and the paddy lands are soon irrigated, and the first crop planting is finished within a fortnight, with the seedlings raised dry in garden soils. There will then be a lull, except for an occasional ploughing of the single crop area, and the preparation of the nursery for the same. Two months will have to elapse after the planting of the first crop before the raising of the nursery for the 2nd crop. The first crop paddy is harvested in September, and after 2 or 3 consecutive ploughings, the second crop is planted within the period of a fortnight. There is then only one weeding and very occasionally two. The harvest of the paddy begins in January and continues to the end of February. In March there is the work of threshing, stacking straw and storing the produce. Kulivettu which is preliminary to levelling in puddle is being done occasionally. The carting of the available compost would take about 10 to 15 days in May. There are thus full four months of no work, when the problem of providing work for the labourer has not been solved. In places where only one planting is done, there is a longer period of no work. This is the nature of work in a purely wetland tract such as is represented by a portion of the

District. But the existence of a good extent of garden lands of good fertility in this village has solved the problem of providing work for the coolies throughout the year. The bulk of the garden lands is put under ragi, which is planted simultaneously with the first crop paddy. This requires only one irrigation as the rainy season sets in soon after. Chilly is the next important crop of the village occupying about 25 per cent of the dry area. This is the money crop, and much attention is paid to it. A small area is put under various vegetable crops such as gourds, pumpkins and yams. These find a good market in towns. Large circular floats of pumpkins sailing down the rivers to distant towns is a common sight when the rivers are full and this is a very cheap form of transit. All these are the season crops. The winter crops are also varied. The ragi lands are put under maize, cumbu and other minor cereals. Gingelly helps the tenant to pay a portion of his rent in kind. A luxuriant crop of tobacco along the sides of rivers is an excellent sight. The plantain is also a very profitable crop of the padugai land. The soil on which the two latter crops are raised is formed of a rich deposit of fine sand and silt, on both sides of the river beds. As there is a constant addition of fresh silt every year and occasionally washing or scouring away of the same, these soils are always rich and grow any crop without any manure. The busy mirasdar would ever have his hands full, if he chooses.

Many of the landlords of this as well as any other village in the district are absentee, and it is no exaggeration when I say that there are many such gentlemen who do not know where their lands are situated. Agriculture is not worth the attention of many who enjoy very lucrative professions—ministers of states, members of the bench and the bar, and many other distinguished men in various lines of work hail from this deserted village. The lands of these people are managed by agents who as a rule are paid very low. The agent has not any active part to take. The lands are cultivated by the tenant on share system, the landlord getting $\frac{4}{5}$ and the tenant $\frac{1}{5}$ of the grain and $\frac{1}{2}$ of the straw. The agent is not allowed to cultivate on pannai (Homo farm) system because he could not be trusted with all sorts of income and expenditure which this system involves. He has

only to keep a stock of seed and advance it to the tenants, supervise the planting and harvesting and take the master's share. The land lord does not trust the agent and the agent knows what opinion his master has of him, and so it would not affect him, if he now and then attends to his own interest at his master's expense. The tenant has no better example to follow, and he too can pilfer something now and then just before and during harvest, and escape free.

Some of the families have got a representative of their own, who after an attempt or two at secondary education, has been recalled to do administrative duties at home. Agriculture is a despised profession for him because it is a punishment for not doing well at school, and even the very cooly condoles with him for his having been brought down from the pedestal of the town school to the village agriculture. He is himself loath to soil his feet with the mire of the wetland; he is moreover quite unaccustomed to keeping out in sun and rain. So in this instance also the tenant is allowed to cultivate on share system. The tenant will have more interest in cultivation, because, the greater the produce, the greater will be his share. This is how the bulk of the lands of the village, and also of the District are managed. It is these Varam lands that give the poorest yields. Very little manure is applied to these lands. Manuring is landlord's interest, but he has no or very few animals, and so he has very little manure. The tenant applies all his manure to the garden land which is really his bread-giver. A fifth of the produce of inferior grain would never be an inducement to apply manure to wetlands. Ploughing is only in name and after planting, the tenant turns that side, only during harvest, the work of irrigation being attended to by the village irrigator. If weeding is to be done, it is the landlord that must goad him to attend to the same, and he should also advance some grain for cooly wages. This disinterestedness on the part of the tenant is also due to the fact that the increased produce in paddy land is not in direct proportion to the amount of labour expended on the same, as is the case in garden land, where the ryot is sure of a greater income for every day he works there. The process of harvesting and thrashing is one of mutual deceit. The tenant would try to throw all the grain into the stack

by incomplete thrashing, so that he may remove the grain from the stack later on. The land lord has thus to be ever vigilant, and if he attended to another work while thrashing is going on several sheaves would have gone into the stack without being thrashed. And the landlord has his own turn; he measures out only the cattle thrashed paddy for the tenants' share, and the measurement too is less. It is not necessary to say who is a better cheat as unfortunately both are cheated by Mother Nature in not giving them half as much as She does to the more honest and industrious ryot.

There is still another type of landlords of real Agricultural merit, who farm quite well, and live a decent life. Very few people of such type are found in every village, and these have generally been trained from the beginning by their parent in Agricultural pursuit. These people invariably keep a number of plough animals, engage permanent men, and do wetland cultivation themselves. Such people are called Pannai cultivators. Even these people, only cultivate the paddy lands themselves, and let the garden lands to their permanent coolies and tenants on annual leases. In the case of better type of tenants, the land is continued to be kept by the same tenant for several years, the lease being renewed each year. The lands are estranged even from such a ryot and given away to another man for short periods, on a higher rent, for cultivating more intensive crops like plantains, betel vine or tobacco. These crops require some capital and more skill and labour for raising and marketing. These every ryot cannot afford and only men with experience and capital undertake this work. The same land cannot be put under such crops every year and they thus go after fresh lands each year. There is thus a disturbance in the cultivation of the land by the same tenant. The lands after such intensive crops are also left poor and are given away to the usual tenants at lower rates. This and the want of mutual trust are the reasons why lands are not given away on longer leases. The garden lands are thus never sufficiently improved.

These are given away to the cooly class for cultivation because they are difficult to be managed by the easy going wetland mirasdar. Permanent coolies are preferred in the first instance, because the cooly

cannot be provided with work throughout the year, and he can supplement his wages by the income he gets from the garden land where he works during the off season. It is only the offering of the garden land at a lower rent that is the inducement to attract coolies to permanent service. The accepted meaning of the term permanent service is that the attendance of the cooly is compulsory when the landlord requires it, but there is no guarantee of permanent work throughout the year and whenever he is not provided with work he would not get any wages. Wherever there are not enough drylands there is a custom in the District of giving about 35 cents of wetlands free of rent for the coolies' own cultivation.

With permanent work for more than half the year, and excellent garden land at low rent for his cultivation where he can work during his leisure, one would expect the position of the labourer to be very comfortable. But this is rather an exception, than the rule; the cooly can attend to his work only when the mirasdar can spare him. Ragi planting and paddy planting are simultaneous, but the tenant can only attend to his work after the paddy planting is over. The season thus gets late. His own paddy may be over ripe and the grains will be shedding but he should finish the harvest of his master's crop before he harvests his own. Thus notwithstanding the low rent and good soil, the tenant cooly gets only a poor crop. The operations cannot be done in season and a poor crop can only be expected, and the cooly is scarcely able to make both ends meet. Not only the pannai cooly, but even the varam cultivator has certain compulsory obligations to the landlord. The maize or tobacco may be wilting for want of irrigation but the varam tenant must attend the marriage festival of the mirasdar for a week or so. Attendance on minimum or no wages is quite compulsory on occasions such as storing grains in the saer stacking straw and so on. If I ask a mirasdar, why he does not allow the tenant to harvest his paddy crop, until his own is finished, the invariable reply is that the tenant would not attend to the landlord's harvest afterwards but would go away for daily wages outside, which is specially high during harvest time. This is also to a great extent true.

The title of "Mirasi" is commonly associated with certain false and most prejudicial notions about manual labour, which is supposed to be a mean and degrading act. This is noticed here even among the non-brahmin class. "Hollow Moopanar" I recently addressed a friend of mine who was working with his coolies, "You seem to take much interest in agriculture now-a-days." The poor young man had almost lost his wits at being thus seen in company with the coolies in actual work, and he offered a hundred apologies by way of explaining his unworthy act. By way of contrast I cannot refrain from alluding to another instance. When last I went to Mr. Abraham Panditha's garden at Tanjore to see his son, a friend, and class mate of mine in the Agricultural College, he was not able to talk to me until his work was finished. How proud he was to be at work with his workmen in a work man's costume. It is men of the latter sort that every village is wanting in. Labour is dignified, and agricultural labour is far beyond comparison. This repulsiveness to manual labour is noticed not only in the richer class but also in the poorer ones whose very existence depends upon their own exertions. The caste cooly man works in the mire, and does every kind of work, but the cooly woman would not do the planting for her husband; it is supposed to be beneath her dignity. Although there are more than 200 families of the cooly class in this village, with at least twice as many women capable of manual work, there are only about 100 pariah women coolies who would attend to transplanting. The period of planting is thus unduly prolonged. The coolies' housewife would rather pick up fallen ears in others harvested fields and do petty pilfering, pocketing all insults from the pariah watchman, but would not stoop to help her husband in harvesting his field. Nothing more ruinous to the poorer class (no less to the rich) than such silly notions about manual labour. There are about 200 families in this village entirely dependant upon the village and the area per family works to about $3\frac{1}{2}$ acres of which a little less than 2 acres will be wetlands and the remaining garden lands. This area ought to be more than sufficient to engage the full labour of a family and provide a happy home. One pair of plough-cattle is kept for every 5 - 6 acres of wetland, or

for every 3 acres of garden land approximately. As the water is lifted by the picotah, big cattle are very rare, except for cart use.

The cattle of this village, as of every wetland tract, are the weakest and smallest of their kind. They are supposed to be sufficient, as wetland requires very little ploughing. These cattle are of course the natives of the land, and no mother ever condemns her son of any fault however bad he may be. So the landlord is quite happy with the products of his own cow. Every bit of land is under cultivation. The stubbles of the harvested paddy field are the only pasture and that for 4 months in the year for the whole cattle of the village. Indiscriminate grazing and breeding is the rule. Paddy straw is almost the only fodder that the cattle can have and concentrated food is too costly for these creatures. Under these conditions, one cannot expect better type of cattle to be bred in the District. With about 45 inches of rain fall, excellent water supply, rich soil and good garden lands this village is pre-eminently suited for raising very good crops of fodder at very little cost. Cutting a crop when in full bearing, for feeding cattle is a strange story. It is supposed to be a sin to cut the crop like that, and the ryot's range of imagination is very wonderful in comparing the action to the murdering of a pregnant female. But this idea is bound to go, as many superstitious ideas have gone before, when people realise the advantage of this system. A certain amount of demonstration is only necessary and the younger generation of the agriculturists referred to above, would really like to try these novel things. I feel sure that these people may more easily be persuaded to agricultural improvements with the advice of the officers of the Agricultural Department. The raising of fodder crops, for which there are many facilities, would make common grazing unnecessary to a great extent, and no body would then afford to keep these wretched cattle. With consolidation of holdings and the system of raising fodder crops established, the evolution of a system of enclosures is only a question of time.

With these broad features of the agricultural practices of the village in view, the question of improvement does not offer serious

obstacles or difficulties, as the problem is a very simple one. Their agricultural sayings and the details of cultivation are the essence of generations of agriculturists. The materials are all there and a good workman is only necessary to lay a proper foundation, and the edifice of economic agriculture will be raised by the people themselves in a short time.

The division of landed property by the members of a family is inevitable, but the educated non agricultural member who is earning a good income abroad need not be so very particular to have his just share of the ancestral property which he is either not able to look after or which is too small for his constant attention. The procedure will be helpful to both parties. The scattered nature of the holdings require immediate attention. The work of mutual exchange must be more thorough and efficient. A certain considered amount of Govt. interference in checking this evil would be a great boon. Some more concessions may be given to start with by way of lessening stamp duty for this purpose. The systems of cultivation as at present practised have got to be radically changed. The annual nature of the leases, whatever the cause of its existence may be would never tend to improve the land. The want of trust in tenants who may leave the shores at any moment, is brought forward as one of the reasons why long leases are not given. The bulk of the emigrants of the village are bad cultivators with adventurous spirit. The loss of such men are not really so much felt, and the village is probably the better for having lost some of the useless men. But it is only the leaving of heavy debts behind them that causes loss and disaffection among the landlords. The production of a certificate by the emigrant to the effect that he has no debts to be discharged before he quits the shore or some similar way of protection of the landlords, interest is sincerely wished for. About the better type of tenants, they may be encouraged by giving them advances for purchasing good pairs of cattle and for raising more valuable crops themselves occasionally in their own lands. It is even good to work on joint partnership with the tenant. He can expend much of manual labour, and the mirasdar may pay up the rent, the value of manures and any extra charges in cultivation.

The net profits may be divided equally. This system is bound to work successfully and both would be much better off. The share system is good in principle, but the tenant's interest must be made greater by offering him a greater share. The better yield that would then be obtained would more than compensate the extra share the landlord gives the tenant. Even then that the absentee landlord should try to go into share system of cultivation, would not work well. The best thing for him would be, if he cannot manage the lands with the sole aid of an agent, to let the lands on long leases to reliable individuals. He should be prepared to bear a portion of the charges on permanent improvements that the tenant effects upon the land. This would be a real inducement to the ryot to improve the land by heavy manuring, sinking wells and such other ways. The pay of the agents who manage the lands is quite insufficient. With very poor pay and various temptations, it would require a very strong will to always look to the master's interest alone. In many cases the trial of an improved method or the growing of green manure crop has been to a great extent hampered by these agents. If a departmental officer suggests anything to the absentee landlord, the matter is naturally referred to the agent. This man somehow does not brook to be intruded upon by outsiders and his business is to see that the trial, in the first instance, is a failure so that the landlord may not bring any further suggestions. The trial of an improvement is a progress in the wrong direction, and a success in the same would pave the way for further improvement, which means a greater attention upon the land by the landlord. This is a great check to the agent's interest which he does not like. A better paid more interested agent would not do this. An interest in the land can be created by better pay and also by allowing the agent a portion of profits over and above the normal.

Failure in an attempt has too often been the cause of condemning the very further attempt at the same. It does not make them enquire into the cause of failure, and to see that further can be done. The lack of such an interest is one great cause of degeneration. Failure should be made a sign of success. Even the Pannai cultivator is not

without his defects. He has to be taught the most elementary principles of Farming. The haphazard, happy-go-lucky plan which is at present adopted will not help to successful agriculture. Agriculture is a business, at any rate is becoming a thorough going business, and only men with business habits will succeed. They should be made to realise the changes in time and that men should adapt themselves to circumstance if they are to succeed in the keen competition for existence. Other nations study our tastes and requirements in order that they may produce such articles and sell it to us. But the Indian cultivator is only producing what he was doing when the village was self sufficient. But now the extra produce goes to industrial centres, and the ryot does not care to know where his produce goes, how the article is sold to them, whether he can grow different crops suited to other markets and so on. Thus for instance maize is grown in this village to a large extent. This is used as food by the lower class and the rest is sent to Pudukotta, a distance of 37 miles where the stuff is partly fed to cattle and partly used as food by the cooly class. The American corn flour which is a daily requirement in almost every house in the Dt. can best be produced at home, by trying the introduced maize crops and a small capitalist will have a busy trade. Tobacco again is a very luxuriant crop and the ryot only adopts a very crude system of curing and the cured product finds only a poor sale. How very profitable it would be if any one would learn the improved methods of curing, and marketing. He should be able to know what sort of tobacco the market requires and should be able to prepare that kind of production.

The economical use of labour is not understood. The carrying of head loads of grain and straw from the thrashing floor to the place of storage or to the home stead is a very common practice. The carting of the stuff is a far cheaper and quicker method. Absence of roads to wetlands is one of the reasons why the former practice is adopted. The construction of roads into the wetlands is a very important improvement. As it is, the produce, unless it is carried immediately in head loads from the thrashing floor, has to be temporarily stored there for more than a month, before the lands dry up for cutting cart

tracks. Pilfering is the consequent evil. In some cases the produce has to be urgently transported either for sale or other reasons, then heavy charges have got to be incurred. The putting up of a road running along a number of important thrashing floors is a necessity. There is no waste of land as coconuts would thrive very well if planted on both the sides.

The question of manuring the lands is never paid any importance and I may say the value of manure in production is not fully understood. Green manuring is out of question where indiscriminate common grazing is the rule. Even the raising of green gram in the whole of the village has been stopped for want of union; any member in the village simply allowing his cattle to trespass on the ground that he would allow the cattle to graze in his own land which lies in the midst of the other fields containing pulse crops. This trespass of cattle by disinterested members increased gradually and now the raising of field gram has absolutely stopped. Truly the question of moving space for cattle necessitates that there should be some area set apart for that. Then one part of the village may be reserved for grazing and the other part may be used for raising a green manure crop. This step would be of much use. The use of phosphatic manures to wetlands ought to prove highly profitable here as the soil survey, and experiments on crop show, and demonstration and preaching are necessary. The financial condition of the agricultural population of the village may be very easily guessed from their agricultural practices. Capital is only had by the absentee landlord as a result of his non-agricultural earnings. Most of the regular cultivators are in perpetual debts. The wetland produce is not quite sufficient to meet his annual family consumption, the cooly wages and also the assessment. In a normal year the first two instalments are paid by the sale of paddy in the thrashing floor itself. For the rest he goes to the tenant who owes his rent for the garden land. The ragi crop the ryot has harvested, is partly used up and the rest he can ill-afford to sell. The green chilly which was giving him daily some money he could not accumulate into a lump sum, for the number of taverns, on his way back from the town where he sells his chillies, are so many that atleast one of them attracts his

unwary mind and he spends most of his money. The root crops and minor cereals only give a portion of the rent and the rest he has got to meet by loans from the landlord himself at 18% interest. In abnormal years which are not infrequent the amount of indebtedness only increases. The mirasdar's banker is the Nattukottai Chetti who gives him money at 12% interest. One marriage in the family means another heavy debt. The number of expensive festivities in connection with one individual during one generation is really very large. An average landlord with 15 acres of land costing about Rs. 15,000/- will have to set apart atleast Rs. 300/- every year. This I take from the following calculation. A big marriage would happen once in 6 years and would cost Rs. 1000/- and the secondary ones for the 5 succeeding years, at least Rs. 150/- a year. But he gets from his lands only a rental of Rs. 600 a year, with which he has to pay the assessment maintain a big family and meet litigation charges. He has again very little working capital. A portion of the produce he sets apart for cooly wages, the few implements are made every year on payment of a few Madras measures of paddy. A pair or two of cattle are the progeny of his own cow, which only feed upon the paddy straw which is had in sufficient quantity. Land is good, labour is plentiful, but capital is nil. With a cheap and sufficient labour and fertile soil capital can easily be created. One thing is necessary, which is exactly what is wanting. This is interestedness. The landlord is abroad, and the tenant is asleep. Very few mirasdars keep any account of their income and expenditure, to enable them to find out their financial condition. Most of the transactions are only entered on the indelible pages of a strong memory, developed at the expense of a skilful intellect necessary for successful agriculture. It is thus quite a common thing for the sons and wife to assemble around the dying man, and enquire about his monetary transactions. It is only then that the full assets and liabilities of the family are known.

The ryot when asked for an account of his returns, expenses and profit, invariably gives the same answer, that if the ploughman begins to calculate he cannot have even an ollock of grain as profit. This is really true, and the immutable belief in this theory has been the cause

of the nonsaving of even an ollock of grain. The few accounts that they keep, are never of any use in helping to find out the profit and loss of any cultivation he has done. Nobody cares to calculate the expenses under various items of cultivation charges compare the same with others or with his previous figures and find out where he has lost. It is this sort of accounts that is really necessary to successful farming. This has yet to be created. The ryots clamour of heavy assessment and little yields and no profit, but they are not able to substantiate their statements by properly kept accounts. It is only then that they will be able to convince the Govt. about their grievances. In a place where people do not keep any accounts of their own income and expenditure—in fact many of them do not know how to keep it—it is hardly possible for them to understand anything about the village accounts. Few people know the survey numbers of all their fields, their correct measurement and the definite assessment. The karnams accounts are invariably the gospel and the receipt given for the money by the village munsiff, settles the thing for the year. Certain common works in the village such as the clearing of the irrigation channels the drinking water pond and cost of temple festivities are all met with from the proceeds of the common lands which gives about Rs. 300 a year. The villagers assemble once a year or more on the pial of a vacant house, and discuss work to be done, the budget is passed, and the works done according to their urgency. No regular accounts are kept for this also, loose bits of paper showing the expenditure are kept by one of the prominent members, and are destroyed after the work is completed.

The village common land is a sort of basis for the present cooperative activity that is at present existing, which is essentially the clearing of the main irrigation channel, and deepening the same. There is very little else done in this direction at present. Even marriages and funerals where the presence of atleast one member from each family is a social obligation, are not properly attended. The possibilities of cooperative activity in agriculture here are vast, and their appearance is only a matter of time. The present inactive state is due to the disappearance of the older type of men and the coming in of a

fresh generation, who have begun their agricultural life only now. These should make themselves at home with their new business before they can develop further activities. They have perhaps failed to pass examinations at school, but are educated enough to understand the principles of cooperation, and under the fostering care and guidance of an educated sympathetic village every one of them would make an excellent cooperator. Paddy is the most important crop of the village and cooperation in matter of getting seed, purchasing manures, the raising of green manure crops, would all save a great amount of expenditure. The paddy crop planted at different dates ripen almost simultaneously and problem of harvesting quickly, and at a cheap cost by the joint purchase of an efficient harvesting machinery would be an effort in the right direction. The period of harvest and the time of paying land assessment come together, and the ryot could only sell his paddy crop to pay off his rent. A very large amount of stuff is suddenly sent to the market and the value suddenly goes down and the ryot has thus to choose one of the two alternatives, to preserve the paddy until the normal price is reached and borrow from chetties at 12 to 15% interest, or to sell the produce for a very low price, to prevent the accumulation of debts. An agricultural bank, which would advance ryots on the security of their stock, at low rates of interest, can be usefully started, which may be under the control of a central bank. This village, as I said boasts of many rich educated men. In as much as the progress of a nation is greatly aided by its administration and patriots so also the progress of a village depends upon the effect which the wiser and more talented men of the village bring to bear upon their less enlightened bretheren. Instead of their giving their earnings on loan to the chetties at 6 to 9% who lend out at from 12 to 18% they may very well give some money to these villages, through a cooperative bank. A Cooperative Society here, as in every village of this district, is very easy to start if the big wigs would advance some money to the society, take part in the activities, until some of the younger men are trained in business methods and have realised the objects and the effects of cooperation. If the objects of cooperation are instilled into their minds, the work done by this means, the progress attained in other places, explained to them, and the necessity for the same be brought

home to their minds by facts and figures suited to their understanding; and if one of the richer sympathetic mirasdar would resolve to spend a few of his vacations in his village, with the object of working at this subject, co-operative Society of a very strong foundation is only a matter of a few days' or months' work. The improvements to be effected in every village are many sided. These when attempted produce good results but in most cases they are not lasting. For permanent improvements to be effected, two points have got to be brought home vividly to the mind of every ryot. (1) Dignity of labour among the rich as well as poor and (2) importance of business methods in Agriculture. These may be effected by a series of lectures in every village about the defects in their agricultural practices, how they effect their national development as well as their own well-being, how improvements could be effected. The usefulness of magic lantern demonstrations along with the lectures in demonstrating the business methods, cooperative activities, the use of machine powers and various improvements by other nations need not be too strongly emphasised.

A word to the Leaders of Public life. The Legislative, Municipal and other Councils are not the only places where the salvation of a nation can be worked out. Let me appeal to some of the less successful patriots who have failed by few votes to secure a seat in those coveted positions. Please turn now to the village where you were born, think of the youths now grown into mere men, with whom you played in your youthful days. They require urgent succour. Lift them up and the nation will lift itself up. For they form the foundation of a nation, especially a nation that depends mostly upon its agriculture. Any colossal structure or ambitious scheme is doomed to fall to the ground when the foundation cannot support it. Here is the whole work that has been long neglected. Better late than never. Here is ample work for a thousand patriots. The unaided missionary work of the Agricultural Department is bound to produce fruitful results but your help would accelerate the progress a hundred times and more.

(Sd.) K. RAGHAVACHARIAR.

Notes.

The Director of Agriculture and the Deputy Director of Agriculture S. Division were at Kaseragod in the latter part of the month, to select a site for a Farm.

M. R. Ry. M. Varada Reddy, Landlord Butchireddipaliam, Nellore Dt. writes:—"I have sown Bengal Daincha broadcast in April for green manure for the succeeding paddy crop (as advised by the Agl. Dept). It has grown 15 feet high. It is unpalatable to cattle being thorny. I think the coming paddy crop may yield very luxuriantly, as the Daincha grows. Surely it is in easy reach of the poor as well as of the rich to procure green manure as much as wanted (i. e.) to any extent."

Estate Notes.

We regret to announce that owing to illhealth and other pressing work M. R. Ry, M. R. Ramaswami Sivan a. l. has found it impossible to continue the Editorship this year which he has been so ably carrying out ever since the inception of the Journal. We are, however, thankful for the assurance of his warm help and support and hope that he would soon recover his lost health and take a responsible portfolio in the Union next year.

Mr. S. G. Roberts I. C. S. visited the Institute and the Farm. The Hon'ble Mr. Buckley commissioner of agriculture was present at the College day on the 10th and also at the Conference on the 12th.

Honorary visitors. The Hon'ble Mr. E. F. Barber, The Hon'ble Mr. P. Ramarayanaiyengar and Mr. Vengail Krishnan

Nayanar were also present at the College day and Conference. Mr. K. Parameswarn Nambodripad of Kurumathoor also attended.

The minor Zemindars of Newington headed by Messers C. J. Morrison and D'La Hay visited the College the day after the Conference.

In honour of Mr. S. L. D'Silva, of whom an appreciation appears elsewhere, a successful social gathering was held in the College on the eve of his retirement. Most of the European and Indian officers of the Institute including many of his old students and friends were present. An interesting programme chiefly consisting of indoor games was gone through at the end of which Mrs. D'Silva gave away the prizes to the successful competitors. After refreshments to both Europeans and Indians the gathering witnessed a performance of mimicry, Ventriloquism and Shadow-graphy by Mr. Subramania Iyer of the Entomology section. Messrs Rajagopalier and Sundara Rao Bhutgoswami were responsible for the musical part of the programme in addition to the Gramophone. Mr. T. V. Narayana Rao the oldest student of Mr. D'Silva on the estate spoke a few words of farewell to Mr. and Mrs. D'Silva in appreciative terms. Mr. D'Silva replied in a few well chosen words. The interesting and successful function was brought to a close with three cheers to Mr. and Mrs. D'Silva who took leave of us shaking hands with all present. Messrs D. Ananda Rao and K. Cherian Jacob are to be congratulated for the excellent get up of the function. The students also gave Mr. and Mrs. D'Silva a social gathering in the Hostel quadrangle which was also successful. Group photos were taken on both the occasions.

At a general body meeting of the club held on 19th July. Mr. B. Viswanath—the Secretary—presented his report about the progress of the club during 1914-15. The great event of the year

was the occupation on 24 August, 14 of the new club building which was the outcome of voluntary donations from the members and well-wishers helped by a substantial grant from the Government. The strength of the club during the year was 63 as against 50 of last year. The members were supplied with 4 English local dailies and one Tamil daily and 14 weekly and monthly journals including illustrated ones. The increase in the number of journals was due largely to the formation of a circulating library which paid half the price of the journals, for the privilege of circulating them to its members at night. The finances of the club were quite satisfactory—the closing balance being Rs. 177-2-11. The Tennis section worked very well during the year and contributed members for making up estate teams in matches. The Badminton section showed only sporadic activities. The formation of a foot-ball section was organised but did not progress owing to the ground being occupied by the D. P. W. A parallel bar was added to the club mainly from private contributions. 3 dinner and 3 tea-parties and a whole day excursion marked the social activities of the club. The Nucleus of a library was formed by contributions from members and notably by presentation of numerous books from Mr. T. B. Fletcher. There were several conversaziones during the year on various subjects—scientific and general—given by members and by distinguished visitors. After the reading of the report, the election of the office-bearers for the current year was attended to. Mr. K. Rangachariar, Rai Bahadur—was re-elected President, and Mr. Y. R. Rao was elected Secretary. Messrs. P. A. Subramania Aiyar, B. Viswanath and K. Sankaranarayana Aiyar were elected members of the managing committee and Messrs. K. S. S. Aiyar and K. S. Puttaiyar, auditors. With a hearty voto of thanks for the office-bearers of the previous year the meeting came to a close.

Officer's Club, }
29-7-1915.

Y. RAMACHENDRA RAO,
Secretary.

Athletic Club:—This short space of time was very lively with activities of the Athletic club. There was a Hockey match between students and ex-students during the College day. It ended as a drawn game. Messrs. R. C. Wood and F. R. Parnell played for the Ex-students. A very interesting and keenly contested cricket match was played with the Newington wards. It was ultimately declared drawn as for want of time three of the Newington players and four of the College team had to go without batting, yet the college scored 132 runs as against 157 of the other team. On the college side the Principal Mr. R. C. Wood was responsible for 36 runs and Mr. Vittal Rao for 65. Out of the Newington players the Hon'ble Kavalapara nair scored 60 runs and Messrs. C. J. Morrison and D'La Hay 61 and 24 runs respectively.

Six players selected out of the Officers and Students of the Tennis Club played a tennis match with the Newington team of six players. It was also very interesting and the College gained by a narrow margin of 1 game over the Newington players.

His Highness the Gaikwar of Baroda and the Maharani accompanied by the Diwan and suite visited the College. The Principal took them round the various sections of the College and Research Institute.

Amongst the volunteers who have been taking classes at the newly started night school for coolies on the Central Farm, we have to mention the names of Mr. Ramaswami Raju and Vetry. Hospital Compounder Ramaswami Goundan in addition to the three names we have already published in our last issue. We regret the omission.

Departmental Notes.

Mr. Narasinga Razu Asst. Farm manager Samalkota to relieve Mr. D. Panakal Rao who is transferred to the Central Farm Coimbatore. This cancels the appointment of the former to Central Farm.

Messrs. C. Krishna nair and C. S. Gopalaswami Rao, Field men Govt. Mycologist's Office have been confirmed from 17th June 1915.

The appointment of Mr. C. Narasinga Razu L. Ag. and the transfer of Mr. D. Panakal Rao, L. Ag. have been cancelled by a subsequent order on 26-7-1915.

One month's privilege leave has been granted to Mr. M. Raman, Asst. Farm manager.

Mr. Vittal Rao, L. Ag. is appointed as the 2nd Botanical Assistant to the Govt. Sugarcane Expert in place of Mr. C. Nathaniel, B. A. resigned.

We are glad to hear that Mr. L. Sanker Kumar Pillai, L. Ag. of the last batch of licentiatees has been appointed as Botany Instructor on Rs. 50/- in the C. M. S. College Tinnavelly.

SHOW GARDEN ✻ PLANTS AND SEEDS

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Notice.

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THE JOURNAL
OF
**The Madras Agricultural Students'
Union.**

Vol. III.

August 1915.

No. 8.

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

The War Anniversary.

On the 4th of August 1915—the anniversary of the commencement of the Great War with Germany—the whole of the Estate in response to a circular issued by the Principal, met at 9-30 A. M. in the large quadrangle on the ground floor of the College. A large table had been improvised into a platform to which one of the huge stone pillars, decorated with a large Union Jack formed a suitable back ground. The whole assembly—composed as it was of all the officers, European and Indian, and the Students—formed a huge ring around the platform. Amid the cheers of the gathering the Director of Agriculture ascended the platform and explained in a short but stirring

address the purpose why they had met there that day. The following speech of the Director is printed in toto for the benefit of the reader.

"Officers and students of the Coimbatore Agricultural College and Research Institute.—It is a year ago to-day that we in common, with those in many other parts of the world, heard with great regret and some surprise that war had broken out between Great Britain and Germany. Some had warned us from time to time that we must consider war with Germany as a serious possibility because that country was steadily preparing for it. Chief amongst these was Lord Roberts well known in India. But the general impression was that Civilisation had so far advanced, that commerce and trade of different countries were so closely linked, that finance was so complicated that no nation in Western Europe would readily wage war upon its neighbour; and even after the struggle had actually commenced prophecies were exceedingly common that the war must be over by the end of the year or even earlier. The struggle was too large, the expense was too great for it to last long. But here we are one year after the declaration of war with the struggle still continuing and, we are met together not to rejoice at a coming peace which would permit us to our normal activities, not to celebrate a great and crushing victory, except perhaps the success in South Africa, but we are here to associate ourselves with many hundreds of thousands of people who are meeting to-day in similar assemblies in all parts of the world to express a grim and solemn determination to continue the fight. This event has been one of the surprises of a year which has been full of surprises. By the fight Germany has been able to make, it has been rendered clear to the whole world, that she has been preparing methodically and systematically for some such war as this for a large number of years, and to a much greater extent than any one had ever imagined. By her treatment of Belgium she has shown both her utter disregard for the promises she had made and that she carries the horrors of war among the civil population in a ruthless and barbarous manner never yet imagined. She has not hesitated to sink without notice at open sea defenceless ships merely carrying passengers. She has openly boasted that strength and

might alone constitute right and her professors and teachers have taught and written that world domination founded solely upon force is Germany's destiny in the world. That a highly organised and developed nation could advocate such principles and adopt such methods and steadily and systematically prepare for them in the present age has been the great surprise of the year for the rest of the world. But the year has also brought some great surprises to Germany and one of the greatest of these must have been the realisation that the world as a whole will not tolerate such principles and such methods; that the adoption of them has filled most countries in the world with utter and complete disgust; that although countries were not prepared for such a struggle as has been imposed upon them yet they although unready did not shrink from it and are now more than ever determined to see it to a close. One great outstanding fact which has operated to Germany's chagrin and surprise and to the intense satisfaction of every member of our Empire has been the unanimity and readiness with which all members of our powerful and loosely knit Empire have responded to the call for help in chaining this brigand of the world. It is a matter of great pride to all in India of all shades of opinion that India so quickly took up her share of the burden. South Africa, which Germany especially expected would break loose, has also after dealing with some internal trouble just conquered one of the largest colonies Germany has ever founded. Indians and colonists from all parts of the world are now fighting side by side, or in conjunction with, the British, French, Belgian, Russian, Servian and Italian armies. There must be some deepseated reason for such conjoined action and that reason is to be found in the belief of the majority of the peoples of the world that this Earth of ours would be an impossible place in which to live if the principles for which Germany now stands were to gain domination, that empires founded merely upon force and might are intolerable and inimical to progress, that whatever be the differences between countries, yet nations must be allowed to live and let live. The actions and spirit of Germany offend their deepest moral sense and it is because of this strong and wide-felt feeling of intense indignation that they are determined to continue to a successful issue this war which is the most costly that has ever been waged, which has affected the trade and method of

living in every part of the world, the effects of which are now being felt even in our remotest villages of India in the fall in prices and rise in the rate of interest. But whether we are called upon to suffer the grief and pain which necessarily follow the loss of those especially near to us or whether we are called upon to continue to keep normal activities going as far as possible in very adverse times, yet we are determined that this struggle must continue until it has been borne in upon every country of the world that a brigand among nations will not be tolerated, that higher principles rule the earth than strength and force and stealthy secret preparation for war. It is to record this grim and solemn determination to see the battle through that meetings are being held to-day at this anniversary of the out-break of the war in all parts of the world; and since that determination takes its rise not from any desire for self-aggrandizement but from a deep feeling of injured moral sense, it is one which I am sure we all whole-heartedly agree with and support. This is no idle resolution which we can conveniently leave to others to adopt. The experience of the past year has brought home to each one of us how wide-spread the effects of this war are. There is hardly a village in Southern India in which the calculations of the farmers have not been upset by the sudden fall in the values of cotton and groundnut or by the tightening of the money market. And although these economic disturbances have fortunately not been nearly so severe as was at first feared yet we all know that the continuance of the war will prolong the period of uncertainty and difficulty. In such a time it behoves each one of us to practise the most careful economy so as to be able to weather this period of stress and to support our country, though at the same time the great moral obligation remains upon us who remain at home to do our utmost to alleviate the sufferings of those of our compatriots who are fighting our battles for us, whether by helping the Madras War Fund or the Indian Relief Fund or otherwise. The spirit which prompts this determination to continue to a successful end this war which is waged in defence of principles we all value also warns us that that end cannot be attained without individual self-restraint and self-denial. It is in the full consciousness of what this means that these many thousands of meetings are being held to-day, and I am sure that each and all of us will endeavour to bear man-

fully whatever share of the burden may fall to his lot. Hence the expression of our determined resolve is a grim and solemn act.

I will only ask now that those of you who wish to do so will come with me into the quadrangle and give three cheers for 'THE FLAG THAT MUST PREVAIL'."

The assembly headed by the Director moved out in all solemnity suited to the occasion, and responded to the call heartily.

Wilted shoots on Neem trees (Margosa, Melia azadirachta.)

Visitors to Coimbatore during the months of January and February would not have failed to notice that many of the neem trees assume a rather distressful aspect, by reason of the presence of large numbers of dead and wilting twigs. The leaves of such twigs droop down unnaturally, wither into an abnormal yellow brown colour and ultimately drop off, leaving but the bare dried and shrivelled shoots. In very bad cases almost all the twigs may wilt away in this manner, causing the trees to look as if they had been struck dead by lightning. In spite of this dismal appearance, the trees seem to recover completely in a short time; shedding the dead leaves as usual in March they put forth new shoots, burst into abundant blossoms and assume an altogether gay appearance.

The wilted twigs are generally of a yellow brown colour, with several large dark patches to which are usually found attached small lumps of gum that had oozed out from fissures in the dead bark.

In previous years, attempts at the investigation of this attack having been made at a wrong time of the year, no clue was

obtained as to the real cause of the damage and it was generally believed to be due to the insidious action of some fungus.

Recently, however an examination of affected trees made by the writer at the beginning of April '15, revealed the presence of the young ones of a bug—*Helopeltis antonii* attacking the young shoots. A thorough investigation clearly demonstrated that the wilting of twigs was unmistakably due to this bug and that this disappears by the time the twig dries up. The adult bug is a slender red-brown insect—with a remarkable resemblance to certain Ichneumon wasps. The head and the eyes and the long feelers are black, the thorax reddish orange, the wings smoky and the abdomen dark brown with a prominent greenish white patch. The curved bluish eggs are laid in the tissues of the tender shoots and hatch in about 6 days. The young ones are slender, reddish insects with rather long spiny legs and an ant-like appearance.

The bugs puncture the tender shoots with their beak and feed on the plant-sap; but while feeding they seem to inject some irritating secretion through their beak which kills the plant tissues and causes the parts around to turn brown. When punctured in a large number of places the entire shoot dries up.

Outside Coimbatore, wilted twigs on Neem trees were noticed around Dindigul and at St. Thomas Mount, but it could not be ascertained whether, in both cases, it was really due to this insect. Neem trees do not appear to suffer from this disease anywhere in the Ceded Districts.

As it would be very interesting to gather information as to the distribution of this pest, the writer of this note ventures to hope that the readers of this Journal—distributed as they are in the various parts of this Presidency—would be so good as to make observations as to the presence of similar wilting in Neem trees in their districts and give the writer information, through

the medium of this Journal, as to where and during what part of the year Neem trees show signs of such infestation.

The reader may be interested in knowing that this insect is known to attack besides the Neem tree, Mahogany and Guava, and certain wild bushes and also Tea, Cocoa and Cinchona in Ceylon. Information as to any other tree suffering similarly will also be thankfully received.

Y. Ramachandra Rao.

Snake gourd cultivation in Periyar tract.

This vegetable is cultivated in single crop wet lands in villages round about Melur. The plot is ploughed generally thrice soon after paddy harvest, in the middle of February. Sheep are penned at 2000 per acre and the plot is again ploughed thrice during May. Two seeds are dibbled in each hole in rows 6 feet apart. There is also a system prevailing here, of raising a nursery manured with Farm Yard manure. The seedlings are transplanted after a fortnight when they are about 9" to 12" high; and this system is preferred owing to the crop being better. The distance in this case also is 6 feet apart from plant to plant. Both the nursery and the plot are irrigated the day previous to planting. The seedlings are pulled out carefully and transplanted singly in each hole, the soil having been just previously loosed with mammotti. Care is taken to keep the plot always moist and clean. About a fortnight after dibbling or planting, a mixture of ash and fowl dung in the proportion of 10 : 1 is applied to each plant, at the rate of 20 baskets per acre, each basket holding about 6 Madras measures.

Picking commences a month after transplanting or after 1½ months in the case of dibbled seeds i. e. in the middle of June. Pickings are done weekly on shandy days. Early pickings yield

about 300 gourds which increase to 700 in about a fortnight. This high yield is maintained for about 2 months, after which it begins to decrease. The plot is ready for transplanting paddy by the middle of September.

This crop is generally cultivated by ryots in plots of 25 to 40 cents and a return of Rs. 150 per acre is not considered very high. This system of cultivation not only engages the ryots during the slack season, but affords them with money to dig wells in their wet lands. This facilitates them to raise paddy nursery for transplanting previous to the arrival of the Periyar water. Snake gourd is preferred to brinjal as the latter is more risky being subject to insect pests.

K. Sankara Aiyar.

Calicut Town and Vegetable Supply.

The population in Calicut Municipality is 78,417. Putting roughly 3 pies worth of vegetables per head daily and deducting about 30% for the poor classes and backyard cultivation Rs. 800 worth of vegetables are consumed daily. Most of these come from localities on the eastern side of Calicut collectively known as Kizhakkumpuram which is made up of the villages of Chevayur, Kovur, Iringellore, Mayanad &c.

The following are the best and most important of the vegetables.

Banana and minor varieties of plantains. Elephant foot yams.

Colocasia (*chembu*) varieties including kizhakan, Notti &c.

Bringals, Cumeumbers, Melons.

Cowpeas and Cowgrams (locally known as *Payaru*) Gourds &c.

One will be surprised to see the large quantities of these being carried on heads in baskets or in *kavadis* along the road from 6 to 12 o'clock during the day.

These vegetables are cultivated in both dry and wet lands, in the former from January to November and in the latter from September to February. The crops are mostly rainfed supplemented by pot-irrigation at the early stages, in the case of dry lands and late stages in the case of wet lands. Details of the cultivation of these vegetables will be dealt with in future notes.

The villages mentioned above contain 75% of dry lands including topes and the rest being narrow strips of paddy land between ranges of hills. Manure supply is limited and most of the available quantity is used for dry land cultivation.

The uneducated poor cultivators in whose hands entirely lies at present the supply of vegetables have to carry every day their produce to the town which is bought off in the way by middlemen and in the town by shop keepers at a cheaper rate and the latter dictate their own terms to the customers. The shop-keeper gets the lion's share. Neither the hard working cultivators nor the easy going consumers are in any way benefited.

It has been observed that the system of cultivation as adopted at present is very unsatisfactory and will admit of considerable improvements as the facilities for such are really great.

There is ample scope therefore for some scientific agriculturist with only a limited initial capital to start systematic vegetable cultivation in any of the villages mentioned above which are all connected by roads to the town where the demand for vegetables is ever on the increase. He can thereby become rich and serviceable to the public.

M. Govinda Kidavu.

Notes.

A tree known locally as Ambach has been found out from the region of lake Chad by some explorers. It belongs to the *mimosa* family. Ambach grows in abundance in the

muddy river tracts of that region and grows with such rapidity that a few months suffice to cover a vast region of swamp with impermeable forest. In a season it attains a height of 12 to 15 feet with a diameter of 8 to 10 inches. The most remarkable property of the wood is that its specific gravity is .1 when dry and .34 when impregnated with water while the specific gravity of dry cork is from .2 to .24. The texture of the fibres is, however, close enough to enable the timber to be sawn into planks which have been already used for making tables and doors. The warlike tribes residing in the Chad region make shields out of it. Logs of this timber can be safely used for crossing rivers or making life-belts and floats.

Attempts are being made to cultivate it in Algeria and the South of France wherefrom hails the party of explorers who found out the plant. *K. U. K. M. (The Indian Agriculturist).*

Treatment of cholam (shorgum) seeds and other cereals before sowing against the attack of mice, rats, ants and birds:—Take a pan half full of wood-ashes; take enough kerosine to damp this, but not to make a thin paste. Soak the seeds for two or three hours in water, then put them in the mixture and shake it through. The seeds get coated and can then be sown. They may then be shaken through a sieve to get rid of the superfluous wood-ashes, but this is not necessary.

The seeds can also be treated by being coated with tar. Put the seeds in a bucket or kerosine tin, and pour coal tar thinned with kerosine if necessary, over it. Shake the tin until all the grain is treated and the superfluous tar can be poured off. It has been found to be sufficient to soak the grains in tar-water which is made by keeping water for some weeks on tar, and stirring occasionally; then draw off enough of the water to soak the seed for three or four hours in it.

The kerosine and wood ashes method is the cleanest and easiest. *K. R. (Agricultural News).*

Mr. V. H. Gonehale says that the rotation,—1st year cattle manure, 2nd year fish manure and 3rd year 10 lbs salt per tree—is practised in Konkan Division for coconut and mango trees. *M. R. R. (From Bulletin No. 59 of 1914 of the Bombay Agri. Dept.).*

Sir A. H. Church, K. C. V. O., F. R. S., M. A., D. Sc., &c. died on 31st May at the age of 81 in Kew gardens. He was Professor of Chemistry in the Royal Agricultural College, Cirencester, for several years and was also Professor in the Royal Academy of Arts and the Cooper's Hill College. His range of chemical knowledge and contribution to chemical literature were wide and varied. He had made a special study of Agricultural chemistry and contributed largely to vegetable chemistry. He is best known to Agricultural students by his revised edition of "Johnson's chemistry of common life," his "Laboratory guide" and his "Foodgrains of India." He was one of the greatest authorities on the chemistry of Paints, Precious Stones, Porcelain and Earthenware on each of which he has written good books. *M. R. R. (Chemical News).*

A Student of Class III writes as follows about an excursion to Pallapalayam:—"Pallapalayam is a small village in Palladam Taluq and is situated eight miles east of Coimbatore. It has 1250 acres of cultivable land of which a major portion (as much as 700 acres) forms wet lands which are protected by a tank of three months supply, the Noyal river channel and wells. The chief crops grown are paddy, sugarcane and betel-vine.

In this village we found an enthusiastic and well-to-do ryot owning about 25 acres of wetlands, who spoke very highly of the departmental work. His appreciation of the work of the Department has resulted from his own personal experience with regard to planting

single seedlings of paddy for the last three years. He said that in this method of planting, he got increased outturn both in grain and straw. He attributes this higher yield to the vigorous growth and tillerings of the plant when planted singly.

As a consequence of his success in single planting the Department was able to win his confidence and recently on the suggestion of one of the Farm Managers, Mr. W. Raghavachari, he has begun to grow green manure crops in paddy lands.

In two plots, each measuring $2\frac{1}{2}$ acres he has grown *Daincha* (*Sesbania Aculeata*) with seeds of his own production. In one plot the seeds were sown in the first half of May (beginning of Vaikasi) and the other about the end of May. He took advantage of the water on the opening of the channel to start the germination in both cases and with one more irrigation and the help of the few showers of rain, *daincha* has grown quite uniformly throughout the plots to an average height of 8 feet in the early sown plot and 5 ft. in the later sown plot. He intends to pull the plants and use them for about 10 acres. The early sown crop had flowered and the ryot intends to reserve a portion of the plot for seed for his next year's use. This crop has already served as an object lesson to some who have also sown *daincha* and we hope that next year a larger area will be under green manure crops in this village.

The fact that the ryot though illiterate is advocating the teachings of the department by example in his own village speaks very well of the Department. If we could find a handful of such ryots in similar localities where conditions are particularly favourable, the propaganda work of the department will be crowned with success at no distant date."

Plantain cultivation for leaves:—Plantain is generally cultivated for fruits. Its cultivation for leaves is seldom known. Between Tanjore and Tiruvadi a distance of 7 miles plantains are largely cultivated near Tirupanthurthi merely for leaves. Here plantains are planted 6 feet apart and will remain in the land

for about a year only. So an acre will plant about 1200 suckers. From a plantain and its side shoots, about 100 leaves are obtained in a year and also a bunch of fruits. Leaves cost annas twelve per 100 on an average, though the range is from 10 annas to Re. 1—8—0. A bunch of fruits will cost annas 4. So each plant gives an income of about one rupee. Deducting cost of cultivation, an acre of plantains intended for leaves gives a net income of Rs. 500 per acre. This system of cultivation is very profitable near towns.

In the second year, the land is prepared in the same way and suckers are planted 6 feet apart again for leaves. This one year cultivation of plantains for leaves may be profitably practised near towns. (A. S.)

Estate Notes.

The Students' club is entirely self supporting, and depends for its funds on the subscriptions of the students themselves, and other 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.

Officers' Club.—There were three conversazioni in the Officers' Club during the current month. One was by Mr. K. S. Vaidinatha Iyer, M. A. L. T., Principal of the Coimbatore College on Dr. Rabindranath Tagore's "Geethanjali." The talk, if not speech,

was a very interesting one and it brought home to the audience the greatness of the Doctor whose unique work "the Geethanjali" procured him the Nobel prize. Another was an interesting talk to which we were so kindly treated by Mr. Dawson of the Madras Forest College on "Theosophy." It was an instance in which a European gentleman was talking highly of Hindu religious principles to an appreciative audience mostly Hindus. The third was by Mr. M. R. Ramaswami Sivan on the various products of coal tar. He made this purely scientific subject an interesting and instructive talk showing samples of the various products and explaining their economic uses.

Students' Athletic Club.—A well contested Cricket match was played with the Stanes' European High School team in which the College players scored 80 runs against 76 of the Stanes' team.

A foot ball match was played with the Coimbatore College team, our team gaining 4 goals to nil. The return match ended in a draw.

A Hockey match with the Police Recruit School was played lately. In spite of the fact that some of the match players of the College were out in camp it was really creditable to the Athletic Club that the College gained 5 goals to nil.

The Annual report of the Union for 1914-15 and the list of Members corrected up to 5th July 1915 are printed as Appendices A and B respectively.

Departmental Notes.

The Director of Agriculture was in camp at the Agricultural College and Research Institute for a number of days from 30th July to 14th August '15. While here he inspected the various sec-

tions very minutely. The Commissioner of Agriculture also inspected the College and Research Institute on the 6th of August 1915 accompanied by the Director of Agriculture.

The Officers of the Mycology section who were engaged in spraying operations against the well known "Mahali" disease on areca nuts have all returned to Coimbatore as the work for the year is over. The damage done by the disease to the areca crop has been large indeed and the remedy quite effective.

Appointments.—Messrs. T. Budhavidaya Rao, K. Ramiah, K. Gopalakrishna Raju and Rajagopal Mal have been confirmed in their posts as Assistant Farm Managers from 5th August.

Mr. M. K. Nambiar, Assistant Farm Manager has been posted to Central Farm—to join at once. He has just finished the spraying operations against Mahali around Kumaranullur.

Mr. S. Pranatharthiharan, is appointed sub-protem Asst. Farm Manager vice Mr. C. S. Madiab, on other duty under the Court of Wards on Rs. 35-3-50 and is posted to Palur—to join at once.

Mr. K. Ramanuja Chari, Asst. Farm Manager is transferred from Samalkota to Central Farm, Coimbatore—to join immediately.

SHOW GARDEN ✻ PLANTS AND SEEDS

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THE JOURNAL
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Vol. III. September 1915. No. 9.

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The Fifth College Day and Conference.

The Fifth College Day and Conference was held this year from the 10th to 12th July. The work of conducting the various functions was entrusted to two committees, one for Sports and the other for Entertainments. From amongst the Staff and Students a Volunteer corps was also raised for the occasion under the Captainship of Mr. M. R. Ramaswami Sivan assisted by Messrs. A. K. Subramania Iyer, C. Narayana Iyer, K. Unni Krishna Menon and K. Ramiah as Lieutenants who did good service in attending to the comforts of the visitors of whom a large number from the various parts of the Presidency attended the Sports and Conference. As usual the hostel catered to the wants of the Indian visitors while the European officers of the Estate entertained the European guests.

On the evening of the 9th, the Sports ground was made ready and preliminary heats were run in some of the items under the able guidance of Mr. F. R. Parnell.

Among the most useful visitors that attended the function mention may be made of the Hon'ble Mr. Buckley the Commissioner of Agriculture, the Hon'ble Mr. E. F. Barber the President elect and the Hon'ble Mr. Ramarayanaiyengar Honorary Visitor, Mr. Chadwick, Mr. and Mrs. Anstead, Mr. and Mrs. Hilson and Messrs. H. C. Sampson, A. K. Yegnanarayana Iyer of Mysore, I. Raman Menon of Cochin, K. Ramasastrulu Naidu, Mr. Md. Miran Sahib and J. Chelvaranga Raju and a large number of departmental officers kindly deputed by the Director in addition to numerous other old students and well wishers of the Union.

What with flags and buntings and tents scattered all over, the College Maidan presented a very gala appearance and all arrangements were completed by the forenoon of the 10th instant. The usual crowd began to gather even from the early hours of the afternoon and the day was specially fortunate this year in having had a bright and clear sky. An English band from St. Michael's orphanage was in attendance throughout the evening. During the evening Messrs. R. C. Wood and D. Ananda Rao were at Home to the guests.

A cross country race was run on 4th July when Messrs. R. C. Wood and F. R. Parnell kindly acted as judges. The rest of the events were gone through on the afternoon of the 10th commencing at 3 p. m. Messrs. Mac

Carthy, Hart and Hilson acted as judges and Messrs. Filson and Humphreys as starters and Mr. Tottenham and Rev. Mathews as time keepers. Mrs. Cumming very kindly gave away the prizes at the termination of the Sports.

The following is the list of prize winners.

Cross Country race of 4 miles.	1. Audinaraya Rao. 2. Venkatachela Mudaliar. 3. Arulanandam Pillai.
100 yards race.	1. K. S. Ramana Rai. 2. Dharmalinga Mudaliar. 3. Achuthan Nambiar.
Long jump.	1. Achuthan Nambiar. 2. Ramana Rai. 3. S. Dharmalinga Mudaliar.
Putting the shot.	1. Ramana Rai. 2. Samuel Nalla Thambi.
Quarter mile race.	1. Venkatachela Mudaliar. 2. K. Achuthan Nambiar. 3. S. Dharmalinga Mudaliar.
Throwing the cricket ball.	1. Audinarayana Rao. 2. Anantharamaier.
Half a mile race.	1. K. Sanjeeva Rao. 2. Venkatachela Mudaliar. 3. Audinarayana Rao.
High Jump.	1. S. Dharmalinga Mudaliar. 2. Ramana Rai. 3. T. G. Anantharamier.
Slow Bicycle Race.	1. K. Rangaswami Pillai. 2. K. Sanjeeva Rao.
Hurdle Race.	1. Venkatachela Mudaliar. 2. Ramana Rai.
One mile race.	1. Audinarayana Rao. 2. Venkatachela Mudaliar. 3. Arulanandam Pillai.
Obstacle race.	1. Kunhappa Nambiar. 2. Venkatachela Mudaliar. 3. Kappuswami Iyengar.

Relay race.	Class II Students 8.
Tug of war.	District Staff team Captained by Mr. D. T. Chadwick.
Half a mile race open to outside students.	1. John—L. M. H. School 2. Narasimhalu—L. M. H. School. 3. Meran—Police Recruit School.

The Vengail Krishna Nayanar Championship Cup was won by Venkatachela Mudaliar, a second time. A few small prizes were awarded to school children, peons and coolies for whom special races were run. The thanks of the Committee are due to the gentlemen who acted as judges and to Mrs. Cumming for giving away the prizes. The Principal wound up the proceedings of the day by a short speech thanking Mrs. Cumming and other ladies and gentlemen who kindly responded to the invitation and made the function a success.

On 11th morning a group photo of the members was taken prior to the conference which was held in the big lecture room. The Hon'ble Mr. E. F. Barber took his seat as President of the conference amidst loud cheers. The President having declared the conference open, the Principal as the ex-officio President of the Union welcomed the visitors to the conference in the following speech.

Mr. President, Ladies and Gentlemen. This is the fifth Agricultural Conference held at Coimbatore under the management and through the activities of the Madras Agricultural Students' Union. It falls on me, this year, as it has on every year since the inauguration of the Conference, with the exception of the third meeting, when I was absent on leave, to assure the Visitors who have so kindly attended, welcome. I cannot say

that they are more welcome this year, than on any previous occasion, because at all times we are glad to see friends from the outside world, to stir us up, to criticise us and to make us remember that there is a world outside our own small community. It is my pride, as well as my regret, that, as the years go on, a large and larger proportion of those who come will be ex-students of the College, and regret, because the fact implies the passing away of familiar faces and of old friends, and pride because I have confidence in the careers of those who have studied here. We have a special cause of grief on this occasion in that the past year has seen the death of one of our Vice Presidents, the late Rao Bahadur J. Dharmaranga Raju who passed away at Egmore in November last. He was one of the most ardent workers in the cause of Agriculture for the whole of his all too short life and could always spare time in the cause of our Union. The words which occur in the speech which he made at the opening of the First Conference may aptly be quoted here and convey a lesson which all members of the Union may lay to heart.

"Gentlemen, let me seriously impress on your minds the responsibilities you are under in joining this Union. Those who have any regard for the welfare of the Union and are desirous that the work of the Union should be a success cherish the hope that much will be accomplished by the rising generation of Agricultural students. In each succeeding year, it is hoped that the work of the members of this Union will be a step in advance of the preceding year. If we do not aspire to this advance, the doings of all of us in the celebration of the College Day year after year will be something like going round a circle without any object, starting from one point and coming round to the same again, not having risen one step higher. We ought, on the other hand, advance as if we ascended a spiral staircase and attain real, though slow, progress."

That progress I can assure all non residential members of the Union has been maintained. In all the several directions in which the activities of the Union are manifested, progress, and by no mean slow progress has been made. I cannot claim much share in the work which has brought this about, but your General Secretary as is the duty of all good Secretaries, brought me his report for perusal a day or two ago, and I do not wish to forestall him after all he has done the work and not myself in giving you the facts. You will agree with me that they are satisfactory.

There is one direction in which steady progress is being made, which does not and cannot figure in any report, and which to one who was not intimately connected with the students as I am, might not be very evident. I refer to the growth of a tradition among the students of this College, due to the more established conditions under which it is now at work, and to the bond which it is the one of the objects and aims of the Union to maintain between the past and present. One direction in which I notice it is the more resigned way in which the newly joined students accept, what must be to them a novel experience, the manual labour of the field classes. There is a feeling that it always has been so that the classes of the previous year, and the year before that, and for many years back have had to do the same, and that it is an accepted part of the curriculum. It may be also of course, that the Principal, is getting older and fiercer each year, and that his wrath is more to be feared, but I hope this is not so. This growth of tradition is shown in other ways and is fostered undoubtedly by the energy of the Union. We have, through the munificence of the Government, a College which in its architectural beauty and in its setting among the hills of Coimbatore, forms a centre round which this tradition may crystallise but to the district worker struggling in some remote village with some more than usually thickheaded and

argumentative ryot, our monthly journal forms no doubt a source of inspiration.

Gentlemen: I must again remind you that I am an ex-officio President, and as such am independent of public opinion and cannot therefore be expected to undertake much of the labours and responsibilities which the Union calls for from its members. An onlooker is said to see most of the game and I certainly can qualify—as I do little but look on, and you may take it from me that the Committee have done their best to make your visit a success, and that it will be successful I have little doubt. I will now ask the General Secretary to read the Annual Report.

The report published in the last issue was then read.

Presidential Address.

At the conclusion of the reading of the Annual Report the Hon'ble Mr. Barber, delivered the following Presidential Address.

The Director of Agriculture, in asking me to preside at this Conference, has done me a great honour, and moreover I feel that he is honouring the community to which I belong. I own that I felt some diffidence in accepting, but when the Director said:—"Just to show there is some connection between planting and agriculture,"—well, I felt I had to come. Of course I had to ponder on those words of the Director's, and I wondered if they had some hidden meaning. The conclusion I have arrived at is, that the Director has asked me to be here to-day that I may help to prove, in some small way, the sympathy which must and does exist all the world over among men engaged in agriculture, a sympathy which covers every climate, creed and colour. You know how one rejoices to see good crops. This is not only because the crops are good and because a good crop is a sight of joy in itself,

but it is because we can realise to a great extent the work that the raising of that crop has entailed and can sympathise with the hopes and fears experienced before the crop reached a state of maturity or safety. This feeling of sympathy is even stronger when the crop is poor, for everyone must sympathise with labour that has failed to attain the full fruition of its labour, but mixed with this feeling of sympathy, there is one of admiration at the stoutness of heart which admits no failure and which, after repeated set-backs, tackles the immediate job on hand anew. Now, gentlemen, you who are learning here and you who are still learning in the outer world, must realise that the best that can be given you is to help the toiler with the knowledge you have gained. It is certain that the knowledge acquired through centuries, if properly co-ordinated, should go far to mitigate failure in bad seasons and to improve the results of good seasons. The principles that underlie this knowledge and the proper application of these principles are, I take it, what you are learning here. Nowadays one hears a great deal about

SCIENCE IN AGRICULTURE.

Its utility is becoming generally recognised, but owing to the notorious conservatism of agriculturists this recognition has been slow. There are still men, all over the world I suppose, who have acquired practical knowledge that has been handed down from father to son, and who still carry on a rule of thumb routine that has been in vogue for years. This rule of thumb routine may be sound enough—it surely is—but it is unreasoning and, therefore, any improvement in the methods so applied must be slow and is a matter of chance. Under certain conditions certain things happen; practice has taught that. Trained investigation, starting with the same knowledge, will prove why such things happen and then research can indicate what may happen, if the conditions be improved upon or modified. Please do not misunderstand me; there is nothing to be said against a farmer who has acquired his know-

ledge in the best of all ways by practical experience. Agriculture is an art rather than a science, and the result to be arrived at is the application of science not in a way that will hinder the artist, but in such a way as will benefit and improve his work. It is quite possible for a man to be a good farmer with little or no book knowledge, and I think we can all imagine a scientist with all the knowledge that books can give to help him being quite at a loss, when faced with the practical routine of the farm. You must bear in mind that science is only

AN ASSISTANT TO A PRACTICAL BUSINESS.

To a business that was practical before the word "Science" was invested, and that, therefore, if science is to be of any use to agriculture it must be expounded in a practical manner. One often hears it said that science is not practical. That is not true; it may be true sometimes in regard to scientific advice, but there is nothing more practical than science, sound science, in the true sense of the word. I got that out of a book on agriculture, so it must be true; as a matter of fact we all know it is true, and in following your avocation it will be your duty to prove that truth and to avoid the error of insisting on the truth of an unproved theory. From my own experience I would say that many mistakes are made through running a theory as a practical fact. A theory under practical test may prove a fallacy. Its adoption before it has been fully proved may lead to disappointment. Your training, gentlemen, should teach you to recognise the fallacy and to avoid the disappointment. The painstaking investigation of cause and effect and the careful and laborious work of research will carry you safely past these pitfalls of theory which, if not avoided will lead to your work being held in poor esteem. I am here speaking as an amateur before men who know their business; so I am open to correction if I say that

ONE OF THE REASONS

that improvements in agricultural methods have been so slow is that research has preceded investigation. This, after all, is only natural. The farmer is looking after and improving the resources of Nature, and why should man enquire too closely into the methods of Nature? Only a few of us are really concerned with why we breathe, feel and live. Almost the first agricultural knowledge that was acquired must have been the fact that, given land, seed, and a certain amount of rain, a crop resulted. It is absurd to suppose that the why and the wherefore were inquired into. The next step was taken by the father of irrigation. Some man found the rain did not come when he expected it, so he picked a big leaf and brought some water from the nearest stream. I think he must have been the first person engaged on research work; he had a theory and proved it practically; he was probably looked upon as a crank while he lived, and it may have been fifty years before his neighbours took kindly to the idea of irrigating. In all humility then, you must recognise that your calling is not the basis of agriculture; at best it is only an adjunct called into help by the brain and activity of man. You have got to recognise this, and also remember that those whom you are called upon to teach may know something that you do not know. Once this is realised you will have no difficulty in making your work practical, and once you are sure of this in your own mind, you must impress that fact on the outside world by precept and example. Unfortunately, it is not always easy to prove the value of work in rupees, annas and pias. You may advise a man to fight a pest or to use a manure. That man can very easily reckon what the pest campaign and the manure have cost him in the first instance; what he cannot reckon so accurately is the value of benefit he has derived, and he even may be so pig-headed as to count the cost only and to ignore the benefit. This should not dishearten you. The

IMPORTANCE OF AGRICULTURE

in this country is so great that you have the satisfaction of knowing that any increase in output of crop, any saving in cost of production, though they may be almost imperceptible in detail, will in the aggregate mean a considerable gain to the country. I feel sure that the history of the Agricultural Department will prove this, and the history of the Department is made up of the work and enterprise of individuals like yourself. I will instance only one money-saving achievement of the Department. I refer to the single seedling planting of paddy. Some one else can tell you what their saving has meant in certain districts. I cannot, but this is an instance of expert knowledge properly applied in agriculture. There is a wide field in front of you, and more remains to be done than has been done already. I should just like to say a word about the calling in life that you have chosen; I think you have chosen wisely. You might have become doctors or lawyers or anything else and won fame and riches in your profession. But the field in any other walk of life is more limited, a doctor's income depends on getting the sick to treat, the income the lawyer enjoys is derived from the foibles and weaknesses of his neighbours. In following your calling you need hurt none, and you can help many. But you will have to meet and overcome difficulties. That is a farmer's lot; it is no life for a shirker or a dreamer. A fool will have no chance in it, for intelligence and thought are necessary, and there is scope for both. A farmer cannot always have everything he wants to make his work easy; he must be thrifty and capable of turning to use anything that is lying about, he must be handy and able to make good makeshifts. Gentlemen, I have taken up enough of your time, but before I sit down I wish to say what pleasure it has given me to be here to-day, and now I think we had better turn to the interesting programme before us.

*Sheep.

For the sake of brevity this paper has been given a title, which if comprehensive, errs on the side of indefiniteness.

I have, however, limited its scope to a general consideration of the improvement of the sheep of the Presidency in the light of the experience we are gaining from our work at Hagari, which work will be referred to in detail.

Before proceeding further I wish it to be understood that there is no pretence of treating this subject profoundly; we have not been experimenting long enough for that. But in work of this nature it is well periodically to re-state to one's self the problem that one is attacking, to take stock of the progress, that one has made and to consider whether the methods adopted are such as are likely to bring one as quickly as possible to the desired end or whether they merely lead to a side track. At such times, honest criticism from others including the man whom one is endeavouring to influence and aid is helpful and welcome. It is mainly with this object in view that this paper has been prepared.

I propose, in the first place, to review very briefly, the different breeds of sheep that are to be found in this Presidency, secondly to treat fully the one breed, with which we are working giving an account of the breed the local method of breeding sheep, the work we are doing, and the results we are obtaining &c., and lastly proceed to the wider question of how to bring about a general improvement.

First then, as to the breeds. So far as I have been able to learn from inquiry and observation there appear to be five main breeds of sheep in this Presidency. In two of these, the coat is hairy and in the other three woolly.

The hairy breeds are (1) the familiar red-brown sheep to be met with in practically every district but in greatest numbers in those

* Paper read by Mr. G. R. Hilson, B. Sc., Deputy Director of Agriculture N. Division.

districts bordering on the east coast which has been honoured by the name of "The Madras Breed" and which is, I should say, numerically the strongest of all; and (2) a white sheep found in greatest numbers in the more easterly taluks of Guntur District, but also to be found in other districts and which differs little from the red-brown breed and may possibly be just a white variety of that breed.

The woolled breeds are (1) the coarsely woolled breed of the Nellore District, specimens of which are commonly white in colour and very long in the leg. It is the biggest of the breeds and bears the doubtful distinction of being the tallest breed in India; (2) your own local breed, named after this district (Coimbatore) which is in good repute for the quality of its mutton and which is, I think, the smallest of the breeds; and lastly, the Bellary breed, with which we are working and which I shall refer to again shortly.

None of these breeds are pure, either in the sense in which the term "pure breed" is generally understood or in the sense that the various flocks of which a breed as a whole is comprised contain the same variations. Each breed has contributed to and received contributions from one or more of the others. The Madras breed because of its being so widely distributed, has contributed to all the other breeds.

Differing greatly from one another as these breeds do, they have one point in which they closely resemble and that is their conformation. Take whatever local flocks you please, you will find that the greater portion of the individuals therein, are high in the shoulder, razor-backed, flat-sided, narrow-chested and wear an air of depression suggestive of a long course of steady and persistent ill-management.

So much for the breeds. We now turn to the Bellary breed. Though named after Bellary District, flocks of this breed are to be found all over the Ceded Districts and in Chittore. I have seen specimens as far south as Kollpatti and as far north as Vizagapatam. It is probably an offshoot of the Mysore breed and tradition has it that there is some admixture of merino blood which came in through the dispersal of a Government flock of merinos maintained some years ago

in Mysore. This may be so, but I can find no evidence of it, either from inquiry or from the breed itself. As a breed it is less leggy than the two hairy breeds or the Nellore and usually a few individuals of fairly good shape are to be found in each flock. The ewes are remarkably good mothers. A few other points connected with the breed will be found in the following account of the local sheep industry which I have taken verbatim from the annual report of the Hagari Agricultural Station.

"The size of the flocks varies from village to village and from about 200 up to as many thousand and in a few cases more. Usually (practically always) the sheep in a village are owned by four or five shepherds and are treated as one flock. From February to May inclusive they are grazed on the black soils of the village after the crops have been harvested, when as the shepherds say "there is good grazing." In the jonna fields, however, there is not much to be got as these are harvested too cleanly by their owners who want all the fodder they can get, but in the cotton fields grazing is better. During this period the sheep are at their best.

From June to February again, they are grazed on the waste lands and as no one thinks of doing this judiciously and in rotation these are kept as bare as it is possible for them to be, with the result that with the cessation of the rains the sheep begin to lose condition and rapidly become emaciated. No fodder is ever fed to the sheep and no shepherd ever dreams of growing a crop for the express purpose of feeding his flock. The only form of concentrated food they get is babool pods, which are to be had during the same period that the sheep are grazed on the black soils.

In most cases black sheep are preferred as they are supposed to keep condition better when food is scarce and are also supposed to withstand heat and cold better than white sheep. Also in some cases it is easier to get a market for black wool than for white, though the latter usually brings about 8 as. per maund, more than the former. Our experience on the farm is not in agreement with the statement of the shepherds on the first two points. In spite, however, of this

preference for black sheep, there is hardly a pure black flock to be seen anywhere. The ram lambs kept in the flock are for the most part black, but the desire to have a large flock prevents the shepherd from ruthlessly discarding all white lambs whether ewe or ram.

The usual proportion of one ram to about 40 ewes is maintained, but as no trouble is taken with the mating and as the rams are usually chosen from the flock itself, the members must be all fairly closely related. The rams are kept in the flock till useless and the ewes till they have dropped five lambs. The two chief mating seasons are June and November, but lambs are dropped all the year round. Three lambs are said to be obtained in two years but this does not appear to be true for all the ewes. Clipping is done twice a year in June and December as it is the belief that sheep allowed to carry their wool for a whole year lose condition. The shears used are of soft iron and of similar pattern to English shears, and the average annual clip per sheep is about one pound of coarse wool. The sheep are always washed the day before clipping as they are usually so dirty and the wool is so coarse that it is almost impossible to clip them unless this is done. Lambs are sold when the grazing on the black soils is finished, and usually bring Re. 1--8--0 to Rs. 3/ according to size. These are poor prices, but it is due to the fact that the ewes rarely get more than a bare subsistence allowance and the lambs are deprived of some of their mothers' milk owing to the desire of the shepherd to make a little money out of curds—a very short sighted policy, since he lowers the price of his stock for sale and also does not give his breeding stock a fair chance from the beginning."

The local method of raising sheep varies in detail from tract to tract but we may take it that in the main the system is as careless as I have detailed above throughout the whole Presidency.

And now as regards our work: We started work in the hot weather of 1912 by purchasing a few ewes and ewe lambs from local shepherds. These were all white woolled and with two exceptions black faced. The ram we used was white woolled and black faced and was obtained from a village (Tornagall) from which no ewes had been

bought. We were fortunate the first year in that one ewe shortly after its arrival at the farm dropped a good black-faced ram lamb and then within the year improved upon this performance by giving us by the Tornagall ram a still better ram lamb, also black-faced. The first of these lambs we called Hagari No. 1, and the second Hagari No. 2. They have both been used as stud rams. The latter is in use at present. We have, however, been unfortunate in that most of the lambs dropped have been ram lambs, though this has had its compensations.

I have said the breed was not pure. The following account will abundantly prove this. From known matings of these white woolled ewes and the three rams already mentioned we have obtained if we consider colour of coat alone at least 7 different types:

(1) altogether black. (2) Black, except for a white blaze on the forehead similar to that seen on many specimens of the red-brown breed. (3) Black on the back and sides and red underneath. (4) Black and white i. e. pie-bald. (5) Black-faced and white woolled. (6) White all over but with pigmented skin. (7) White with pink skin. Add to this that both rams and ewes may be horned or hornless, that some give more wool than others, some have coarser wool and some finer, and some fatten more readily than others and you will have some idea of the mixture with which we are working.

What we are trying to do is to establish a pure white-woolled breed, which with fair treatment will give an average annual clip of about 3 lbs of wool and which will fatten readily. We have chosen white wool because it brings a better price than what is ordinarily termed black and because after the first clip a black sheep begins to turn grey.

In order to get the colour right as quickly as possible our first plan was to use the same ram for all the ewes and continue to do so until each ewe in turn had produced a ram lamb. Each ram lamb when old enough would then have been used on its own dam and her progeny. From the numbers we expected to be able to tell how the inheritance of colour ran and would also find out which of our strains

were pure. The care and trouble required to do this is enormous and too much dependence has to be placed on the shepherd who does not understand what is being done. The plan has therefore been abandoned, except for one or two of the best ewes.

Regarding the weight of fleece we are not, I think, aiming at an exceedingly high mark. Hagari No. 2 has every year so far given us a clip of 3 lbs or over, so that we have made a step in the right direction and if his progeny take after him at all as we expect, we have every hope of succeeding in our aims.

As regards fattening quality I propose to give you an account of an experiment which we have carried on now for two years which will show that we are likely to achieve our aims in this respect sooner than in the case of the other two points.

The plan on which we are working now, is to use the best ram we have, considered from all points of view, for all the ewes and to discard all ewes below a certain standard. If a good ewe gives us a ram lamb, not good enough to displace the stud ram but as good as *that ram*, we will use it on its dam, and try and get something better.

Our grazing grounds at Hagari consist of about 50 acres of uncultivated land, which I shall describe more fully later. We have also about 9 acres of garden land and it is in connection with this land that the fattening experiment was tried. On this land we are in the habit of growing green-manure crops during the hot weather months. We have found some difficulty in getting these crops well worked into the soil if they have grown at all well, even if a light iron plough is used. If however the crop is grazed (not heavily) by sheep, this difficulty disappears. Then the question which arose was why the average garden cultivator should not grow a leguminous catch crop, buy a few store lambs, fold them on this crop, fatten them and sell them at a profit, making some money and at the same time getting his land well manured.

To solve this question, we bought some lambs in the hot weather of 1914, folded them on green crops of cow-pea and teegapesalu, and fed them with cotton seed.

We got some useful information but on the actual transaction no hard cash was received as profit. There were three reasons for this: (1) that the lambs themselves did not, owing to their previous treatment, thrive as well as they ought, (2) that the cost of raising the green crops that year was high and (3) we charged the whole cost of raising these crops against the lambs and credited them only with the value of the manure they gave, which we valued at 50 per cent., higher than the local rate for penning sheep.

We, however, had the consolation that whatever may have been the result as regards the lambs there was no doubt about the advantage on the crops of ground-nut, ragi and tobacco we raised on the fields that were penned in this way. They were easily the best we had ever obtained. Ground-nut in particular gave us a yield 75 per cent. higher than our best yield previously recorded and that on one of the sandiest fields in the garden. I consider we gained by the whole transaction.

This hot weather we tried again, using the ram lambs we had been so plentifully blessed with. They were fed for a short time with hay and groundnut cake and then with hay, green crop and cake, until the green crop was finished. The weight of each animal was recorded at the beginning of the experiment and thereafter at intervals of one month until sold. I have here some statements giving the results of both these experiments and if you will bear with me I will trouble you with some figures.

THE 1914 EXPERIMENT—100 DAYS.

The total charges including the cost of lambs, the cost of producing the green crop and folding charges, feeding with hay and cotton seed amounted in all to Rs. 147/- in round figures. Our receipts amounted to Rs. 132-8-0 in round figures. We thus made an apparent loss of Rs. 14-8-0. Against this, we have to place Rs. 20 as the value of penning calculated at twelve annas per hundred sheep. Also considering the excellent crops that the penned fields produced, part of the cost of producing the crops might very well be charged against the fields. If we allowed nothing for the penning and charged half of

the cost of producing the crops against the field, our loss of Rs. 14-8-0 will be converted to a gain of (Rs. 27-12-0 - 14-8-0) or Rs. 13-4-0.

For the experiment the lambs we bought were about 6 months old and on the details we have recorded one cent of crop would graze eight lambs for one day.

THE 1915 EXPERIMENT—150 DAYS.

This experiment was made more elaborate than last year. The lambs used can be divided into two lots. One lot varying in age from 11 months to 14 months at the beginning of the experiment and the other from 4 months to 8 months. For the first month progress was slow and the average increase per head for the older lot was only 4.7 lbs and for the younger 2.8 lbs. In the second month, the increase was more rapid being 15 lbs and 12.6 lbs respectively. In the third month the amount of increase fell in the case of the older lot to only 3.8 lbs and in the case of the younger lot to 7.5 lbs. Thereafter the amounts of increase were small and after the 4th month which brought us to the beginning of the monsoon the older lot actually began to fall off in weight. We ought to have sold at the end of the second month and certainly not later than the end of the third month. Why we did not do so was because the market at Bellary was dull and we tried to sell in ones and twos but could not get decent prices. Finally in desperation we sent them to Bangalore and are regretting that we did not do so sooner, although it cost us Rs. 2 per head to get them there.

Our charges on this experiment, taking cost of cake including crushing, cost of hay, wages of the cooly who looked after the sheep while they were grazing, half the cost of producing the crops and cost of taking the sheep to Bangalore amount to Rs. 120 in round figures. Our receipts amount to Rs. 142-8-0 in round figures, leaving us with a profit of Rs. 22-8-0. The figure for receipts is obtained by subtracting the estimated value of the lambs at the beginning of the experiment from the actual price received at the end of the experiment. Unfattened sheep sell at about 12 lbs. per rupee live weight, and our values have been estimated on this basis. The figures obtained tally closely with actual offer made for these lambs just

before we began the experiment and I have if anything rather over-estimated their values than underestimated them.

When fattened the sheep sold at $7\frac{1}{2}$ lbs. per rupee live weight. The crops this year were hardly so heavy as the crops of last year but did not cost so much to produce. One cent supplied sufficient grazing for four sheep.

And now gentlemen, I think I have said enough to give you some idea of what we are doing. It now remains to link up our results and experience with outside conditions.

The first conclusion that is forced on one is that improvement of the local sheep will have to start with improvement in management. Under this head I place improvement in pasture and general care of the flock.

When all the sheep of a flock are given no more to eat than is sufficient to keep them alive, they all appear very similar and very bad. But when given ample food it speedily becomes obvious which are the better animals and which are most likely to do credit to their pasture. Also one cannot grow good lambs either for sale or for keeping up the stock of breeding ewes if their development is retarded before birth by ill-feeding of the ewes and after birth by depriving them of some of their mothers' milk.

Our pasture at Hagari was at one time part of the common grazing ground of the neighbouring village and was then as bare and lacking in shade as that area is now. By roughly fencing it, restricting grazing and planting trees, it has been greatly improved and will now carry comfortably 30 ewes with their lambs. It has now become valuable enough to fence in properly. For its further improvement we are depending on babool trees and kolaikattai grass.

Hagari farm is situated in the driest tract of the Presidency and if sandy land such as we have there, can be converted into fair pasture, it is not unreasonable to suppose that it can be perfectly well done in other parts with a better rainfall. Improvement in pasture will have to proceed on the lines of fencing and judicious grazing combined

with planting with grasses and babool trees. For lighter lands Kolaikattai is as good a grass as one could wish for and for heavier soils, Chengali, Marawalli and Hariali, may be recommended.

As regards care of the flock I have already referred to the points in which it is defective.

If these points are attended to, further improvement can be brought about by proceeding on the lines which we are now adopting. By limiting the size of the flock to the grazing area available, breeding from the best rams and discarding all poor stock rapid improvement can be brought about. One ewe which with fair treatment will give one lamb worth Rs. 6, is more valuable than 2 ewes, which with bad treatment will give 2 lambs each worth Rs. 3, because it does not eat so much as the two ewes.

And now one word as to the shepherd himself and I have finished. He is conservative, he is poor and some of his practices are bad, but there are among them men of intelligence who understand that there are possibilities of improving their flocks and we hope when we have got sufficient results to show them to get hold of some of these men and get them to make a start.

Improved Agricultural Implements.*

Ever since the various Governments in India decided to interest themselves in the improvement of Indian Agriculture the question of improved implements has bulked very largely in their programmes so largely indeed that in this respect one may say enthusiasm has run riot. But as you are aware, the attempt to introduce any of them into general adoption proved a failure and beyond a few dilapidated relics of some of these implements which one occasionally comes across in Government farms, there is little left to remind us of these attempts. But even though it was a failure and became a fit object for ridicule I

* Paper read by Mr. Yegnanarayana Iyer M. A. Dy. Director of Agriculture, Mysore.

cannot help thinking that the attempt was a move in the right direction. The failure was due to other causes, which need not be discussed at length here. For one thing there was a lack of knowledge. I mean, the knowledge born out of an intimate acquaintance with the agricultural conditions of the country and the ways of the Indian raiyat. Secondly the time was dominated by the idea that to effect improvements you must work from the top downwards; i. e., have a central farm, train English educated Indians and hope that enlightenment would travel into the interior to the village raiyat, an idea which is luckily going to the scrapheap in the way of some of those venerable implements. Above all there was sad lack of organisation, there was a lack of men and money, consequent on the belief in high quarters that you had only to import a few specialists from abroad to see a revolution produced in Indian agricultural methods. Fortunately for us, time has brought about a change in these conditions and what is more we are feeling the cumulative effect of various economic factors which in those days had just begun to operate. Continued peace, safety of person and property on the highways of trade, more extended and more rapid means of transport both by sea and by land, the increasing demand from foreign countries for all manner of Indian produce, these have raised prices to a pitch never heard of before and have turned peoples' attention to the value of tropical land and to the possibilities of its development. Under these altered conditions, those pioneer efforts in the matter of improved implements are being revived not to meet with ridicule but with the gratifying prospect of being welcomed and taken up by the raiyat. I have therefore deemed it opportune to discuss this matter of improved implements so that we may have the benefit of each other's experience on this important matter viz: *Improved agricultural implements.*

Our indigenous implements have no doubt the advantages of being cheap and simple in construction and fairly efficient; but most of them are exceedingly slow and wasteful. We shall examine these drawbacks a little further, taking the various implements in use at the present time.

Take the plough for instance. Owing to the peculiar V shaped furrow it cuts there are ridges left between every two furrows, which are inevitable even with the most careful ploughing. Under ordinary circumstances these ridges are very pronounced. To stir these ridges thoroughly one has to plough several times before the soil can be stirred well and throughout. Now this same work can be done very much better by a single ploughing with the improved i. e. the mould-board plough. This saving in time enables one to handle at least twice as many acres with the same pair of bullocks—a step directly conducive to the extension of cultivation.

Furthermore it is rarely that the raiyat is able to plough all his fields as well as he would like to in time for sowing; only a few of his fields which he sets apart for the growing of grain for his food are worked thoroughly and the rest are prepared anyhow because with his plough, the work is much too slow. The quickness of work implied by the mould-board plough will enable him to prepare all his fields well and in time and to increase his produce to the extent that this one factor may be capable of. Very often one is asked whether the raiyat really values time. I sincerely believe a more ignorant remark will be hard to find. Time is of the essence in agricultural operations and the raiyat fully realises it. If in spite of it his work is not up to the mark I think it is his poor implements and appliances which are to blame and not he.

The large demand that has now arisen in Mysore for the improved plough is distinctly due to the appreciation on the part of the raiyat of the superior advantages of quickness which this plough confers.

At the numerous ploughing demonstrations we have been holding in different villages this is the feature which most pleases and satisfies the raiyat. To those who have no means of extending cultivation, it has meant economy in bullock labour; for the same work is done more thoroughly with fewer bullocks. To indicate to what extent the improved plough is being taken up, I may say that the Mysore Department of Agriculture sold up to the end of last year over 800 such ploughs; during the current season 1,000 ploughs were ordered

and we are selling them as fast as we are able to fit them up. The most popular plough has been the Kolar Mission plough but any mould-board plough of similar construction would enjoy the same popularity. As the activities of the Department spread further into the Districts, I have no doubt that the number of these ploughs would leap up astonishingly in the course of a few years.

Another clear indication that the plough is appreciated is the fact that some of the local blacksmiths have been copying these ploughs; many raiyats are getting their own shares made locally notwithstanding the endeavours of the Department to cheapen shares by supplying slip-points and bar shares.

Coming now to other tillage implements I think we should strongly recommend a good type of cultivating tool. This is what I mean. After the land is ploughed once or twice the clods have to be broken and the soil brought into a fine tilth. Now in most parts of the country this work is done by the indigenous plough: exceptions may occur to you in the use of the implements called *Dodkunte*—a heavy bladed harrow and *Heggunte*—a three coultered cultivator; but their use is not so general as to affect the problem. Let us see what the use of the plough for this purpose of cultivating really means. The work of cultivation is very much lighter than ploughing and the bullocks are certainly not doing the work they are capable of. A cultivating tool with say four or six tines will cover at least as many times of the ground without in any manner straining the bullocks. At every journey from end to end of the field the country plough stirs only about 4" of space while a good cultivating tool will during the same transit cover about 4' of ground.

We have been recommending a cultivator with six shovels made locally by the Kolar mission, the *Dodkunte* (costs Rs. 7) and Disc harrow (costs Rs. 100) for this purpose. All are being sold but the preference seems to be decidedly for the six shovel cultivator. This tool costs Rs. 12/.

Before I pass on to other implements, I should just invite your attention to the aspect of the cost involved in the use of these impro-

ved implements. To prepare a seed-bed at all satisfactorily with a country plough, it would need certainly 6 ploughings, three of these being ploughings proper and three being in the nature of cultivating. At the rate of 12 as. per day for the hire of a pair of bullocks and a ploughman, the cost would come to Rs. 4/. Using the most costly of the improved implements, one could produce the same and perhaps a better tilth by once ploughing with an improved plough, twice discing with a 6' disc harrow lapping one half each time and cultivating it twice with a six shovel cultivator. This means 1 day plus 5 hours plus 3 hours work, say two days costing Rs. 2/ as an outside limit. So that you could do the work not only more quickly but more cheaply too, by the use of these improved implements.

Before closing this section I may refer briefly to the subject of power ploughing. This method of harnessing steam to the service of man exercises so great a fascination on peoples' minds that with many, improved agriculture is synonymous with the introduction of steam ploughs. Of course it is not necessary to pause and consider whether or not this is a correct view but it may be worth while to see if there is any scope for such outfits. So far as Mysore is considered I should answer yes, to a certain extent. In the black cotton districts, where as you are no doubt aware the field has to be dug once in five years or so to get rid of hariali grass, the conditions are very similar to those that are near Ranibennur in the Bombay Presidency where a steam ploughing outfit is now at work. The fields are very large indeed; fields measuring 10 or 15 acres are by no means uncommon. Even in the areas with the prevailing red loam type, the fields are remarkably large so that one objection at least to the use of steam ploughs may be said not to exist. (Of course I am not speaking of wet lands). Moreover in these black cotton tracts, it is found more and more difficult to get coolie labour for this digging work and even when found little more than an acre can be worked in a season; and the cost of this hand digging is more than even the maximum charged at Ranibennur for the work of the steam plough. So that for this special work at least, I may say that there is scope for the introduction of the power plough.

But the question arises as to the kind of outfit that may be serviceable. Shall we have direct traction or shall it be a Fowler's cable plough? Shall it be a steam engine or shall we have internal combustion engines? The experience so far does not seem to be favourable to the large and somewhat unwieldy double engine steam outfit now in use at Ranibennur. Compact blocks of large areas have nearly all been exhausted: the outfit has to be taken from field to field, much difficulty has been experienced in getting good water for the boiler and considerable expense is incurred in carting the water too. It is then a question for consideration whether a small direct traction outfit consisting of say four plough bottoms with a suitable kerosine engine will not suit this purpose better. Such an outfit will not have the above disadvantages and as only one engine is used the cost per acre will also be very much less.

On the other hand such direct traction has not been found suitable for ploughing more than 8" or 9", a difficulty which perhaps may be got over by the use of disc ploughs. The whole question is however in the programme of the Mysore Department of Agriculture and action will no doubt be soon taken to test these matters.

Furthermore during a recent visit to Poona, I noticed that a Fowler Wyle's motor plough with two plough bottoms had been got out by the Bombay Department of Agriculture to test its suitability, so that before a year is over we shall be having much light thrown on this subject.

Passing on to seed-drills, you are aware that the Bombay Department is attempting to introduce a small American 4 coultered seed-drill costing about Rs. 60. It is doubtful in the first place whether improvements in seed-drills are so urgent as improvements in other implements, in any case I should think the price is decidedly against the new implement.

In the matter of interculturing tools, throughout Mysore the *Yedè kuntè* or small bladed harrows of sizes varying with the intervals of space between the rows of different crops seem to be quite efficient and I refer to them here only to notice a few peculiarities. In some

districts two or three of these are hitched to one long yoke so that with only one pair of bullocks and two or three men this number of rows is intercultured. I should think that this needs copying in other districts. We may note that the working of these interculturing tools shows how the raiyat can manage a two handled implement quite well without needing an additional man, contrary to what we frequently hear about the difficulty of using the 2 handled improved plough. These *yedèkuntès* are so light that with the one handle with which they are provided they cannot be kept steady between the rows; in order to correct this tendency the raiyat uses a kind of stick called "*avè meri*" or Semi handle to press the *kunté* with, thereby using both hands at the handles. In the taluks of Chamarajnagar and Gundlepet, the ryot uses two separate *kuntès* which are held closely together one in each hand. It is somewhat hard to believe how well the raiyat can use these wobbly arrangements, but practice has made him expert.

Next we come to harvesting tools. Even under the best of conditions labour at harvest time is both scarce and expensive. But under ordinary circumstances in most parts of the province raiyats are put to great inconvenience owing to want of sufficient labour and this notwithstanding that the whole force of available labour, men, women and children turn out for this work and earn handsome wages. This difficulty has become so great and so chronic in fact that a suitable improvement however slight it may be, will be welcomed. It is a far cry from the primitive little sickle which is our harvest tool to the self binder and the other monster implements of America. But we may perhaps start with the scythe, and the mowing machine with or without a raking attachment, similar to the Rajah and the Narbada reapers, said to be becoming popular in the Panjaub and in the Central Provinces.

In Mysore the problem so far as these reapers are concerned, is complicated by the fact that ragi is almost invariably grown mixed with a subsidiary crop (ordinary field bean) each row of which alternates with 5 to 11 rows of ragi. As the bean is not ready for harvest till after 45 to 60 days from the time the ragi is ready, you have to save these rows of bean and harvest only the ragi. In fact it was just

to this circumstance that a reaping machine got some years ago for the Hebbal Farm and which does very satisfactory work, was not recommended for general adoption. Still a smaller reaper with a narrower cut *i. e.* less than 3'6" (The Rajah is 4'6" and the Narbada is 3'9") is likely to find favour with our raiyats who may, in view of the great difficulty of obtaining labour, be persuaded either to grow a pure crop of ragi or plant the mixed crop at wider intervals.

For wet lands such as we are used to in Mysore such a machine is out of the question and perhaps a scythe may suit; but even here we are confronted with the difficulty that high class paddy usually lodges and renders a scythe impossible. For the stiffer strawed coarse varieties called *salu bhatta* in Kanarese, the implement would suit, while for the finer superior varieties we have still to use the time honoured sickle, unless indeed varieties are evolved combining the qualities, of high yield and superior grain with a stiff straw.

While on the subject of harvesting tools, I may refer to the case of a peculiarly difficult and expensive crop to harvest. I mean ground-nuts. I do not know what your experience is here, where such a large area is put annually under ground-nut; perhaps much of it is grown as an irrigated crop and the ground is softened a little before harvesting by giving it an irrigation. In Mysore the groundnut is a dry crop and the area is on the increase; but one obstacle is the expense and trouble of digging. It will be impossible on this account, for any raiyat to grow more than can be dug leisurely by himself and his family. Labour is scarce and even if obtainable about a third of the produce will have to be given as wages. In parts of the Bombay Presidency where much ground-nut is grown on the black cotton soil, I have seen a heavy bladed harrow with the tines set at wide angle used for digging the nuts. I do not see why when the ground is not too hard for a bullock implement an ordinary potato digging plough (Rs. 30 or 9 dollars) should not be used, I mean the plough with the mould-board replaced by prongs. If the ground becomes hard of course there is nothing for it but to dig and I have known extreme cases where the crop has been abandoned owing to this difficulty, on

the off chance of a shower of rain some time, when digging may be easier.

Now that we have finished harvesting tools, I shall revert for one minute to tillage tools again. A very good dry farming practice is as you know, to plough up your fields soon after harvest or a little later. Without going into the theoretical basis for this practice, I may mention that the value of such ploughing is recognized in Mysore. In some districts it is invariably practised and raiyats go to great pains in getting this ploughing done but in many more districts it is not. There are reasons for this neglect but I shall refer to only two among these.

Firstly the soil becomes too hard for the plough; this however is not a serious obstacle, for it is not necessary to plough as almost the same advantage can be derived by using a cultivating tool which may scratch the soil say 2 or 3 inches. If we can get the top soil soft enough to absorb the earliest rains we should have done much. I may add here that this autumn ploughing has made it possible for many raiyats to grow successfully an early monsoon crop like gingelly this year while those who began to prepare their fields long after the early rains have had to sow later and their crop is very much poorer. For this kind of work a disc harrow is an ideal implement. But a Rs. 100/- implement with 3 discs on each side is both costly and somewhat heavy. A lighter one with 3 or 4 discs on each side costing Rs. 50 will perhaps meet with a better welcome. After the last harvest, I sent round an agricultural Inspector to visit a large number of villages in the Bangalore Dt. with a disc harrow, with the gratifying result that several raiyats took advantage of the visit and had their fields disced.

Another reason is that at that time of the year all the available bullock labour is busily engaged at the threshing floor or at the cane milling shed. Unless this pressure of work is lightened by the introduction of improvements in threshing and cane milling methods, we cannot hope to get over this difficulty.

This brings us then to the methods of threshing grain and improvements therein. We know the present threshing methods too well to need description here. They are slow and tiresome and wasteful. But is there any object in replacing them by quicker methods? I have heard it said it is the slack season of the year. Why not let the ryots take their own time over it? Now let us examine this question a little closely. A good Mysore village usually has a fairly large tank, below which is an area of garden land and then further on a stretch of paddy and sugar cane fields. There is also a very much larger stretch of dry land close to and around the village, as far as where the fields of the next village may begin. Between the months of January to April, the Agricultural calendar for such a village will be the following.—

WET LAND:—Preparing and sowing Vaisak paddy.
Harvesting and milling sugar cane.
Preparing lands and planting sugar cane.

DRY LAND:—Bringing in and stacking the mixed crop.
Threshing and winnowing the Year's produce.
Dry land ploughing.

GARDEN LAND:—Preparing land and planting cold weather potatoes or other garden crops.
Or in the case of permanent garden of cocoanut or areca, miscellaneous work.

That this period is anything but slack can easily be seen from the above statement. It happens farther that the wet lands are in the possession of men who either do not belong to the cultivating class, or are too well-to-do to work in the fields. They are therefore let out to tenants, who take very little interest in the cultivation, their main interest being in the dry land, which they own, and whose produce Ragi forms the staple food. Consequently these men attend to wet land work only after all their threshing work is finished. Since this takes an inordinately long time, naturally wet land operations suffer, and the most valuable lands in the village are thus allowed to suffer neglect. It is for this reason that we want threshing methods improved.

Already ryots are of their own accord taking more largely every year to the stone threshing roller, because it does threshing work much quicker and with considerably less worry. To those favourably situated, the question for consideration is if a power threshing outfit should not be used. In Mysore we are popularising these outfits. There are two fairly large outfits owned by private gentlemen, and the department owns four. During the last threshing season, we worked the departmental outfits in ten villages, and threshed nearly 41000 seers, charging a fee at the rate of 6 annas per 100 seers of ragi. If we had more men and more outfits, we could easily have served several more villages, for the demand was very keen. The outfits we have been hiring out consist of an oil engine of about $3\frac{1}{2}$ H. P. and an American threshing machine called Pennsylvania, manufactured by Heebner & Sons Lonsdale Pa.

Now I must bring this account to a close. If time permitted a similar case may be made out for several other improved appliances as well, such as power canecrushing mills, pumping machinery, chaff cutters, butter churns and so on. That the ryot does appreciate a saving in time and worry is thus amply evident from the large demand for ploughs, by the astonishingly rapid increase of the threshing roller and by this growing popularity of the threshing machine. I shall add yet another instance of the same tendency, for one of my chief objects in reading this paper is to impress this point. In the *jola* tracts you are aware that ryots put up very large stacks of *kadbi* (dry stalks). The usual practice in building these stacks is to hand up the sheaves along a number of men sitting one above the other on a ladder—a kind of human elevator. Somebody replaced this method by erecting what may be called a *seesaw* or *picotah hoist*.

This is simplicity itself and means a great saving in time and labour. The use of this hoist is spreading every year solely by the force of example. Before concluding, I may be permitted to point out that side by side with the introduction of these improved implements, we should have an eye to the possibility of manufacturing them locally in the country. In regard to at least one implement viz. the improved plough, I think the time is ripe for opening a good 'Plough Works' in

South India. There is an increasing demand springing up, and naturally we should see that our country profits by it and not the foreign manufacturer. More than that, unless there are facilities for prompt and cheap repairs, and for obtaining spare parts close at hand this movement with such great promise of usefulness will be greatly hampered.

Secondly in the case of the costlier appliances like threshing machines, disc harrows, butter churns etc., co-operative ownership should be encouraged. Ryots may not club together in making joint purchases or sales, and the sight of the ryot or his wife walking miles to sell a pot of curds and a pint of ghee, or a basket of vegetables rather than commission one man to take the total produce of the village to the market is common enough, probably because each man believes himself cleverer than his neighbour in cheating a customer. But these same men help each other and lend each other their plough and bullocks in most farm operations. So in the matter of introducing these improved implements on a basis of joint ownership, theoretically at least, the conditions seem to be favourable. So far, only those individuals who can afford to own such outfits by themselves have taken to them. Possibly when people become more familiar with the advantages of cooperation co-operative ownership may naturally come in. But from my experience of the ryot I cannot help remarking that he seems to welcome improvements which would make him independent of his neighbour.

Where he cannot afford to own an implement, he would much rather take it out on hire from somebody who owns it than own it jointly with him. Let us hope however that this is mostly a passing phase, for if the increased efficiency implied by an improved implement reaches him through the door of co-operation, he will gain a double advantage.

In conclusion let me observe that a larger use of suitable improved implements such as we have discussed above will directly result in the extension of cultivation by helping the ryot to cover a large area, in the increase of produce by helping him to attend to all agricultural

operations in time, and where there is scope for neither of these improvements, in the lessening of the expenses of cultivation and consequent increase in his net profit. Since these three objects cannot be nearly all that is meant by the improvement of agriculture, I am sure that a concentration of effort in this direction will bring about a great measure of agricultural improvement.

Iron Plough—A defence.

The Department of Agriculture has been for many years past experimenting on the use of improved ploughs especially to suit the various conditions of land in this country. Though many ryots visit the different agricultural stations with the idea of judging the merits of the improved implements and introducing them in their estates the realisation of the result of such visits has been slow indeed.

In the Central Farm ploughs of various patterns have been tried successfully and the ryots visiting the farm note their efficiency keenly enough and as a result there has been a fairly large sale of monsoon ploughs but they could have been much more had it not been for their wrong conception that the ploughs are too costly to be purchased and their work demands the ryots to maintain more costly cattle and skilful labour and so on.

The ryots do not also understand that an ordinary country blacksmith can do the repair to the plough if ever it requires any. Besides, these iron implements do not require frequent repairs and do not wear out easily.

Therefore I shall attempt to show in the following lines how it is more economical and advantageous to use improved implements in preference to the ordinary country implements, in the supreme utility of which, the ryot has a blind faith. A good

plough when worked should cut the soil in furrows of a rectangular cross section and turn the slice over, breaking it in the operation leaving the unploughed land clear for the next furrow to pass. These ideas are fully borne out in the working of an improved plough. The country plough on the other hand, cuts a furrow, triangular in section leaving small ridges between two furrows, throwing the soil on either side. To have the soil properly ploughed the ryot has to pass the country plough lengthwise and crosswise several times. Therefore practically speaking the seemingly cheap and unskilled labour is much wasted in working the country plough. Further the breaking of a furrow slice is not possible in working with a country plough.

Considering these questions and practical experience it has been clear to the user of an improved plough that the work it does, while passing over an area once, is at least as efficient as a country plough worked several times. Another advantage in an improved plough is that the depth of the furrow could be regulated. These facts will weigh more in favour of the improved plough when we take into consideration the amount of labour expended, not to speak of the time saved. To understand this it may be necessary to measure the pull required to work each of these ploughs in terms of cwt.

The country plough has a draught of $2\frac{1}{2}$ cwts. with a dead weight of 50 lbs. Sivagiri plough or Meston plough fitted with iron body and steel share have got the same draught although their dead weights are 50 lbs. and 36 lbs. respectively. Monsoon plough having a dead weight of 60 lbs. has a draught of 3 cwts. The Sivagiri and Meston ploughs are more often used in wet lands and the Monsoon in dry lands. Comparing the country plough with the monsoon plough the country plough cuts a section of $\frac{4 \times 5}{2}$ sq. inches = 10 sq. inches for $2\frac{1}{2}$ cwts. whereas the Monsoon plough cuts a section 4×5 sq. inches = 20 square

inches for a draught of 3 cwts, worked at the same depth. Therefore the proportion of work turned out is 1:2 while the proportion of draught applied is $2\frac{1}{2}$:3.

Taking the initial cost in the case of a country plough as Rs. $2\frac{1}{2}$, it has to be completely renewed at least every year, whereas the Monsoon plough which costs Rs. 15 has a chisel tip now worth 5 annas which can be easily replaced; the rest of the plough remains in-tact for a long time except for the share piece that has to be replaced once in 5 or 6 years at a cost of twelve annas. The ryot, therefore, gains a good deal if he purchases a monsoon plough for Rs. 15 in preference to a country plough worth Rs. $2\frac{1}{2}$ or Rs. 3.

I think it may be necessary here to detail the various points that contribute to the comparatively less draught for the work turned out and the durability of an improved plough. The draught is always proportional to the work turned out with due consideration to the friction that has to be overcome which is proportional to the roughness of the plough-share and to the bluntness of the cutting edge. The polished steel parts of an improved plough that come in contact with the soil cannot offer as great a frictional resistance as the rough wooden parts of a country plough.

A wrong idea is often entertained about the dead weight of an iron implement in considering the draught and the figures mentioned above have shown that the dead weight has little to do with the draught when the friction of the cutting parts is at a minimum.

The efficiency depends partly on the sharpness of the cutting edge. In an improved plough by tempering the steel share soft at top and hard at bottom which causes unequal wear, the sharpness of the cutting edge is maintained. As regards durability it is needless to mention that iron lasts longer than wood, specially

when the parts liable to be worn out are small detachable pieces and can be replaced with ease and at a small cost.

A. K. Subramania Aiyar.

Notes.

A paper on Grasses and Forage plants of Hawaii by the Agronomist of the station appears as Bulletin No. 36 of the Hawaii Agricultural Experiment Station. Several important grasses and forage plants are described therein. A list is also given of the undesirable and poisonous plants that are met with there and it includes among others the following that occur also in Southern India as indigenous or introduced. *Acacia Farnesiana* known as Peevalam in Tamil and Gabbu Thumma in Telugu, *Andropogon halepensis* (Johnson grass) 'difficult to eradicate,' *Chrysopogon* (*Andropogon*) *aciculatus*, *Lantana Camara* (*Lantana*), *Momordica Charantia* (Chinese cucumber or Carilla fruit) cultivated everywhere and *Psidium guayava* (*Guava*) are said to crowd out and replace the plants which have forage value. *Asclepias curassavica* (*Milkweed*), *Leucaena glauca* (*Koa bush*) which seems to cause falling of hair from horses' tails and known as Tagarai in Tamil, *Ricinus communis* (*Castor bean*), which causes abortion and *Tephrosia purpurea* (*Kolingi*) are said to be poisonous. C. T.

It has been found that some plants are able to absorb and assimilate various sugars including lactose. Lactose was found utilised by vetch, radish and onion. For maize the sugars in order of preference by the plant are glucose, levulose, cane sugar and maltose while for vetch, they are cane sugar, glucose, maltose and lactose. K. U. K. M. (Expt. Station Record. U. S. A.)

Barbadoes Department of Agriculture sugar cane experiment report shows that Sulphate of Ammonia when compared to dried

blood each supplying similar weight of nitrogen per acre when applied to sugarcane, has given better results. Sulphate of potash supplying 80 lbs. of potash per acre, has generally given a better yield than no potash plot. Phosphate plots have, curiously enough, given poorer crops than no phosphate plots. K. U. K. M.

The discovery regarding the functions of the bacteria inhabiting the tubercles found on the roots of certain plants has made a marked influence on the question of maintaining the fertility of the soil. What is regarded as the most remarkable of recent discoveries is the symbiotic relationship between bacteria and seed plants in certain leaves. In 1894 Trimen (late Director of Peradeniya Gardens) drew attention to the small knob like excrescences on the leaves of certain Ceylon Rubiaceae e. g. *Pavatta Indica*. Subsequently the researches of Miche and Von Faber revealed the fact that these bacteria were also Nitrogen fixing organisms.

"Pavetta" is in high esteem as a green leaf manure in many parts. K. U. K. M. (Extract from Tropical Agriculturist).

Observations in Upper Burman Paddies.

Number of grains per plant: The plants of two varieties were transplanted singly 1' apart each way, and the number of grains counted up in each plant. Next year a number of single plant selections were made, sown and planted separately and the counts of grain taken in each. The means of these were, some much higher, some much lower and some slightly lower than the means of the original paddy mixture showing large variations among individual plants. The selection whose mean of seeds per plant is very high, gives also the highest yields of grain per acre by weight. In some cases the yield of these single plant selections are higher than those of the ordinary bulk selected ones by 15 to 20%.

Variations in Weight of Grain: Plants were selected at random in a field and weight of 1000 air dried grains noted. Then 1000 grains of each of the selections in the above field were weighed and the weight noted. The mean of none of these fell below the mean of the plants taken at random, thus showing a part of the effect of selection. This also indicates, that the production of heavy grain is hereditary and consequently that the weight of the grain can be improved by selection. The yielders of the heaviest weight of grain per acre do not, by any means, always produce the heaviest seed.

Tillering: This varies with the variety of the soil and treatment of the plants. Long duration varieties produce comparatively more tillers than short ones. Even in selection there was no striking increase in the tillering power. As the tillers of a plant increase, there is an increase in the weight of the grain; but this increase is not in direct proportion to the number of tillers produced by the plant *i. e.*, as the number of tillers increases the average yield per tiller decreases. A plant with many shoots is not always the best to be selected in yielding high yielding strains. The number of tillers will have to be considered always along with the number or weight of grains borne by each shoot. The condition of the soil also affects the number of tillers produced but there are no definite data about it. Increased fertility due to organic manures and some of the chemical manures like ammonium sulphate, affects the tillering power to a marked extent. The number of tillers produced per plant varies directly, according to the spacing given, but, then there is a limit beyond which, the total number of plants per acre becoming small, the yield will be much reduced. In bunch planting the number of shoots coming from each bunch varies as the number of seedlings transplanted, but not in direct proportion.

Red and thick rice: The appearance of red rice in a pure white riced variety is due only to the cross fertilization taking place

in nature to a small extent. Whiteness and redness of rice act as a single pair of Mendelian characters, the former being recessive. The cross fertilization may take place when the crop is a mixture of both red and white riced varieties or when they are grown close together side by side. K. R. (*The agricultural Journal of India*).

Application of Lime to the soil:—When asked to apply lime to a soil, one may get doubts as to the form in which it must be applied—Limestone, Slaked lime or Quicklime. It has been found by experiments that all the beneficial effects of quicklime and slaked lime can be obtained by the use of limestone also, even with greater safety. The effective nature of limestone depends upon its mechanical condition *i. e.*, the finer it is, the better are the results. Limestone tends to improve the tenacity of clay soils, and liberates potash from the insoluble potash silicates of the soil. It has also a favourable influence on the availability of phosphates in the soil. Since limestone contains clay and other impurities with it, its application is of a decided advantage to light and friable soils. It is always better to apply it in tons—say 1 to 2 tons per acre. For very stiff soils quicklime has been found to be better than limestone on account of its quicker action. K. R. (*From Agricultural News*).

It is indeed a vexed question for the ryot to suppress weeds, especially some of the more noxious ones which behave as parasites on crops. One of them is *striga lutea* Lour (Tam-Chudumalli) known as a root parasite on cholam, sugar-cane &c. The ryot in Vellakinar, where sugar-cane is grown as an irrigated crop under wells, knows that this weed troubles him very much; more so when lands are newly brought under garden cultivation. He therefore grows a crop of Cumbu just before sugar-cane and finds his cane field practically free from striga. The experience of the writer

and enquiries made there again show that Cumbu is not easily affected by the parasite. Therefore it may be a means of starving out the weed with growing Cumbu acting as a tantalising bait, as it were.

It is yet to be seen whether cholam will be thus benefited by a preceding Cumbu crop. K. U. K. M.

A Banana bearing two bunches: There appears a small note and a photograph with the above heading in the Bulletin of the Department of Agriculture, Jamaica, recording this very rare occurrence. It would be interesting to see whether the suckers from this plant are capable of reproducing this habit, as a double fruiting type of Banana might prove of economic value in increasing the output of bunches from a cultivated area. The expectation is, however, that this is an accidental production and not a confirmed character of the Banana plant. K. R.

Estate Notes.

The Students' Club is entirely self supporting, and depends for its funds on the subscriptions of the students themselves and other 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 Government 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.

An interesting event in last month was a garden party given by Mrs. Chadwick on the 10th to the ladies on the Estate. Most of the European and Indian ladies were present at the gathering and a very pleasant and enjoyable evening was spent in the Botanic Gardens. The green shady lawn was looking its best and was soon scattered with moving figures robed in lively hues and the first half hour saw Mrs. Chadwick receiving the guests and exchanging kind words with them. After refreshments, Rai Bahadur K. Rengachariar's daughter sang and played on the violin and Mrs. Rengachariar and Mr. P. A. Raghunathasami Iyengar's daughter entertained the audience by their performances on the Vina. Badminton which had been improvised was rather a novel item, at least for the Indian guests, but was readily availed of by most of the European and several Indian ladies. A gramophone played at intervals by Mrs. Chadwick added to the delights of the evening. It was extremely good of Mrs. Chadwick to have taken such an opportunity to know the Indian ladies at the station.

The "Club Day" at the Officers' Club:—In commemoration of the opening day of the New club building, the "Club Day" was observed on 22nd August 1915. The celebration was strictly of a private character—none but members of the club and their children taking part in it. A Badminton tournament and a handicap tennis tournament were opened among the members in connection with the anniversary. In Tennis the finals were played between Mr. K. Krishnamurthi Rao and Mr. T. V. Ramakrishna Iyer of whom the former came out victorious. Four teams of 5 each competed in the case of Badminton and in the finals the team captained by Mr. P. A. Subramania Iyer won. Between 3 and 4 p. m. Mr. C. Tadulinga Mudaliar was kind enough to be "at home" to all the Club members and their children. After refreshments, Mr. Sesha Aiyar recited and explained certain Sanskrit stanzas composed by himself, touching in a humorous

way certain characteristic personal tracts of some of the members. Some of the children of the Estate then entertained the members with music. Mr. M. R. Ramaswami Sivan helped by Mr. B. V. Nath entertained the children and the members with various tricks of chemical magic. Mr. Subramania Aiyar, Head Artist, Entomology section, by his powers of Ventriloquism kept the audience in roars of laughter. The President Rai Bahadur M. R. Ry. K. Rangachariar, Avergal, then distributed prizes to the winners in the Badminton and Tennis matches and made a few remarks befitting the occasion.

Hockey matches. 31st August 1915. A. C. R. I versus Police Recruit School. A. C. R. I won by 5 goals to nil.

2nd September 1915. A. C. R. I versus Reserve Police Coimbatore. A. C. R. I won by 2 goals to nil.

Mr. T. V. Ramakrishna Aiyar, B. A., F. Z. S., F. E. S., First Assistant to the Govt. Entomologist, has been appointed acting Entomologist during the absence of Mr. E. Ballard on leave on Medical certificate. We congratulate Mr. Ramakrishna Aiyar on the promotion which he has richly deserved.

Mr. M. R. Ramaswami Sivan, B. A., delivered a lecture just before the Michaelmas holidays, on the growth of Agricultural Chemistry before the Students' club. Mr. R. C. Wood, M. A., who presided complimented Mr. Sivan for the interesting lecture.

Mr. M. O. Parthasarathi Aiyangar, M. A. L. T., Special Lecturer, Teachers' College, who is now on a short deputation at this College in connection with the scheme of Rural Schools, gave a delightful chat on "the Algae" before the Officers' Club, which was much appreciated by the members.

Mr. C. Tadulinga Mudaliar, B. A., Chief Assistant to the Govt. Lecturing Botanist, who has been connected with the Madras Herbarium for several years and who has made Systematic Botany his special field of work, has been elected by the Linnaean Society as a Fellow thereof. There are only a few Fellows of that Society in India and we offer our congratulations to Mr. Tadulinga Mudaliar F. L. S.

Departmental Notes.

On their way to the West Coast Dy. Directors of Agriculture Messrs. H. C. Sampson and R. Thomas were in camp here on the 26th and 27th instants.

Appointments, etc.;—Mr. P. V. Isaac, B. A., is appointed to act as third Assistant in Entomology on Rs. 50—10—150 vice Mr. T. V. Ramakrishna Iyer B. A., F. Z. S., F. E. S., on other duty as Ag. Entomologist.

Mr. M. Ramaswami Pillai is confirmed as Field man on Rs. 25—5/2—50 under Govt. Economic Botanist with effect from 11th August 1915.

Privilege leave for one month and ten days has been sanctioned to Mr. P. A. Subramania Aiyar, B. A. Second Assistant to the Govt. Agricultural Chemists.

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Agricultural College, Lawley Road, P. O., Coimbatore.

Printed at the Literary Sun Press, Coimbatore.

THE JOURNAL

OF

The Madras Agricultural Students' Union.

Vol. III.

October 1915.

No. 10.

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

The Insectary.

It is a well known fact that insects loom largely in the activities and operations of the present day agriculturist. We say present day agriculturist, because we have heard many a—gray haired old man assert with that characteristic pride that in those good old days there were very few insect pests affecting crops. Very often insects play such an important part in the economy of the farmer as to seriously upset the even tenor of his peaceful life. A flight of locusts or an attack of swarming caterpillars during a season, means either partial starvation or terrible indebtedness or both to the small holder and naturally he looks to the Economic Entomologist for help. As such it becomes incumbent on everyone who professes to be an Economic

Entomologist to be conversant with the measures for checking the depredations of various insects affecting crops. The number of known insects is legion and the damage many of them do is of various kinds. This means that different kinds of insect enemies have to be treated in different ways, just as different varieties of human ailments have to get different methods of treatment. Thus, before any control measures are formulated, it becomes necessary to note which kind of insect is responsible for each different kind of damage, and having known these, we devise ways and means to check their ravages. It is needless to state that, in prescribing methods, it is always essential to remember, that such measures alone would commend themselves to the public, as can be shown to be both practicable and comparatively economic. To put it more clearly it is found that in the case of various insect pests there are certain habits and stages in their life—histories which often give us important clues to help us in devising control measures—these may be called the weak or vulnerable points in their lives. Thus it is often quite easy to exterminate certain insects at particular stages and extremely difficult to tackle them when they pass on to another stage. It is the duty of the Economic Entomologist therefore to study the lives and habits of different insects in detail and among others to discover those weak or vulnerable points and then suggest remedial measures to his agricultural clientele. In this work an *Insectary* plays an important part.

Recent visitors to the Agricultural College and Research Institute Coimbatore,—including many moffusil members of the Union—might have noted a small building

somewhere about the north-western portion of the College Farm. From its outward appearance—provided as it is with a number of windows and glass roofing at the sides—it might perhaps appear to the uninitiated as a glass house for growing special kinds of plants. It is, however, not a plant house but the *Insectary* or Insect house.

The building which is in charge of the Government Entomologist has been constructed with the idea of making it suitable to breed and bring up insects as far as possible amidst natural conditions. Provision is made to afford plenty of light and ventilation at all seasons and to bring temperature and moisture to approximate outside conditions (as much as possible). Inside the building are some big enclosed pits filled with soil; insects which pass a season in a particular stage in the soil are left here for future observation. In addition to this are a few large cages which are enclosed by wire gauze walls and covered above with glass roof. Besides the important fittings are work benches and shelves for keeping small cages containing different insects under observation. Around the building are numerous small plots of a variety of crops to serve as food materials for the different kinds of insects that are studied in the insectary. In fact the Entomologist welcomes insects to the particular plots as thereby he may be able to study them side by side in the field and in the insectary. Complete and careful records of all observations are maintained and these records, it is hoped, will form a valuable fund of information to help the Entomologist in his work.

It may be asked whether it is not possible to study insects in the fields and whether an Insectary is necessary. The answer, naturally, is that it is not possible to study insects in the field and keep under observation different kinds of insects for a pretty long time. Under field conditions it becomes impossible to study a good many of the minute details which might often help us in devising control measures. Supposing something new appears in the cold weather; with an insectary it is possible to study it through and get an outline of its life history before summer, when perhaps it might appear in numbers in the fields. Supposing again we wish to breed generation after generation, say perhaps, from one pair it is entirely impossible under field conditions. Again, to study and demonstrate to students the habits and life stages of insects which often appear hundreds of miles away, the insectary as a safe place to bring and breed them affords excellent facilities. Of course, it is possible there may be differences in the conditions in captivity and field conditions, but as surroundings inside the insectary are made to approximate outside conditions as far as possible these differences become almost negligible in many cases.

Although some work in the life history and habits of some important insects has been done in the Entomological laboratories till now, it has not been possible to make detailed studies, and the work was done under great many disadvantages. Since the Insectary came into working condition it has been possible to do a good deal of substantial work in the study of the life histories and habits of many important insects. It may be noted that many a little

known fact regarding well known insects, was elucidated only since the inception of the Insectary. It may be added, in conclusion, that this is the second of the kind in India the other being in Pusa.

It is perhaps clear from the above account what an Insectary is and how it attempts to help the department and through it the agriculturists at large.

***The Kangayam Cattle.**

The cattle in this district are either hill breeds (malaimadu: Alambadi and Burghurs) or Kongu-madu: plain breeds (nattumadu Kenganad) or Kangayam cattle. The Kangayam cattle are well known for their excellent qualities for draught purposes. The breed is highly valued and centres round Kangayam whence it is named. These are bred in the whole of the Dharapuram Taluk and the adjacent parts in the Erode, Palladam, Karur, Palani and Dindigal Taluks. The breed in its purest form is found in the herd of the Pattagar of Palayacottai the like of which cannot be seen anywhere else in the Kangayam tract. By a careful selection of heifers and sires for many years he has improved the size and the quality of the breed. He is the most extensive breeder in the Kangayam tract, so much so his animals are designated as "Pattagar's breed." It is very difficult to find another in this Presidency who pays so much attention or carries out the systematic cattle breeding as the Pattagar of Palayacottai.

There are two varieties of the Kangayam cattle: large and small. Both the varieties are found side by side in the Kangayam tract. The biggest sized animals are found only with the Pattagar of Palayacottai and it is incorrect to say that he is the breeder of the small variety.

*Extract from the paper read by Mr. P. N. Md. Miran Sahib, B. A., Revenue Divisional Officer Erode, before the Collego day and Conference on 11th July 1915.

As cattle form the backbone of Indian Agriculture, the question of maintaining its quality and condition is a most important factor in the Agricultural improvement of the country. The development of fine breeds in Europe and America is due to the continued interest evinced by the great land owners, from sovereign downward. The affluence of a farmer is determined by his livestock. It is but proper and appropriate that the Government is about to establish a stock breeding farm in the Kangayam tract.

The preservation and improvement of the best breeds of cattle are perhaps the most pressing questions of the country. The 'Kangayam' cattle are hardy and active with compact body and short and stout neck and legs. They are best fitted for mholé, ploughing in deep soils and for heavy draughts. In the black cotton soils in the south they are almost exclusively used for agricultural operations. These can be worked for over ten years while the hill breeds do not stand for not even half of this working period. Thus in every way the Kangayam cattle deserve special treatment for agricultural advancement of the country.

To understand and distinguish this Kangayam cattle from the typical hill breeds found in the District it is better to describe their special features.

'The Kangayam' is elegant in appearance, with broad face, short thick and pointed horns, short and stout legs, compact body, with no overhanging dew lap, chest broad, hind quarters narrow with iron grey markings about the hump and quarters and front legs, quick and strong. 'Alambadi'—long bodied with horns tapering and well set up backwards rather than to the front, eyes prominent, dew lap lengthy, docile and well fitted for road work. 'Burghur'—are the swiftest and stoniest, moderate in size, head small, horns tapering and longer than Alambadi, fierce and active; dew-lap not so large as in Alambadi.

The Kangayam tract is an undulating plain sloping eastward towards the Cauveri but with a local watershed near Kangayam

falling into the Noyal on the north and the Amaravathi on the south. The soils are gravelly with an admixture of limestone on the surface.

In the Kangayam tract the breeding is mostly left in the hands of wealthy ryots. But up in the hills of Kollegal, Bhavani and Satyamangalam almost every villager has interest in the raising of cattle. In the Kangayam tract the forest area is insignificant and fodder for cattle is provided by reserving part of the patta lands for pastures and growing fodder cholam in lands irrigated by wells. In the hill villages there is only breeding of cattle. The bull calves are sold away when the cows get dry and the hillmen labour under a superstitious belief that unless and until they are sold away their mothers would not conceive. The 'breeding' and 'rearing' go hand in hand in the Kangayam tract. The hill breeds depend on scanty sustenance they have in the forests in summer. When there is no pasture, the cattle in the Kangayam tract are hand fed.

These are free from the evils of communal grazing. The conspicuous absence of common grazing ground, porambokes, combined with the system of private fencing contributes towards the success of cattle breeding in this area.

The quality and renown of the Kangayam cattle depend mainly on the extensive pasture grounds very rich in lime. Every *punja* allotted for grazing is fenced with Kiluvai (*Balsomodendron Berrie*) hedge. This grows high enough to protect the animals from wild winds, though this does not afford proper protection, as this is not allowed to branch thickest at the bottom. Perhaps with proper topping and cutting of the plant, the fences may be kept up thick and bushy from top to bottom. In most parts prickly pear is also planted on the sides, which by its rank growth even encroaches the pasture grounds. Temporary pasture is the rule, though exceptionally good pastures are often left 20—30 years before being broken up as found in the large Korangadu (pastures) owned by the Pattagar of Palaya-cottai.

Kolukkattai grass is raised regularly and is sown after cholam and cumbu are raised. Even garden lands are laid down to pasture. The

soil best fitted for this grass is "odai" jelly—red loam full of canker gravel as it is in the Kangayam tract. With fencing there is complete control over pasture ground. The Kolukkattai grass seeds do not germinate if sown deep. After good ploughing cereal grains are sown and ploughed in. The grass seeds are sown superficially to germinate naturally, with the aid of rain. The peculiar long duration cumbu (nadam cumbu) is sown in this tract now; and in this crop, after it is weeded by ploughing (pairulavu) a few weeks after germination, the grass seeds are sown. Once the Kolukkattai seed germinates there can be no difficulty for its propagation. This has a bulbous root stalk and withstands drought considerably. The animals are turned in the pastures just after summer rains when the grass is over a foot high say in September. They are allowed to remain in the 'Korangadu' day and night till Thai Pongal (January). The cattle during this period are not at all stall fed. They have plenty of grass and pick up flesh gradually. No necessity is felt for any concentrated food during the grazing period. The field proposed to be raised with this grass should be ploughed well in summer rains. Each grass plant may put forth over 100 branches with bulbous roots below. The roots lie superficially and do not penetrate below 3 inches. Once the seeds are sown after ploughing the seeds do not require covering by ploughing or harrowing. This may be sown at the rate of 10 M. M. per acre. This plant seeds freely and its seeds are easily shed. A heavy rain causes a rapid flush of pasture and in 2 or 3 weeks, the parched up pasture grows to sufficient height fit for grazing. This is ploughed up every 3rd or 4th year to quicken the grass. Cereals and grass seeds are sown together. Once it takes root it never dies. This grass can thrive in all lands except in clay soils. This germinates in 6 days. In areas where there is more quantity of grass than is required for grazing, the grass is cut immediately after it flowers and stored. Grass so stored is used for working cattle, milking animals and animals intended for sale in summer when there is little or no pasture.

Without suitable and nourishing fodder, no good breed can be maintained. When natural pasture is deficient, hand feeding is resorted to. Raising of fodder crop is not unknown to the Kangayam

tract. There is a regular practice of sowing fodder cholum closely so as to yield heavily and this is grown at any time in the year, in garden lands when pasture is scanty. Cholum is also raised largely in dry soils during rains. Ryots in the Kangayam tract indiscriminately raise any variety for fodder. I am advising them to go in for 'Periyamarjal' cholum which gives heavy yields both in grain and stalks. In garden lands where cholum fodder is raised I am asking the ryots in the Kangayam tract to irrigate the stalks cut. The stalks left after cutting grow again. In this way cholum fodder may be kept on the ground for a longer time and the fodder used according to necessity like grass.

Lucerne (Alfalfa) is raised on a small scale by the Pattagar of Palayacottai. This was introduced by him only a few years ago. This is a most nutritious and rich fodder. This increases the flow of milk and is given to cattle mixed with other fodder. This is likely to thrive well in garden lands in the Kangayam tract as they are rich in lime with good drainage. The roots go very deep and withstand severe drought. After deep ploughing and manuring, the field should be prepared in ridges 1 cubit high and the seeds sown on ridges and watered. The grass is cut whenever it flowers, say 10 times in a year, and in this way an acre may yield about 150 to 200 cart loads in a year. This requires irrigation once a week in summer. This will stand for 10 or 12 years, if it is not allowed to seed and is properly attended to. The breeders do not go in for any other fodder crop. This can be sown at the rate of 3 to 4 M. M. per acre.

Sunn hemp can, with advantage, be raised in the single crop wet fields in the Amaravathi valley where there is good drainage and this may also be raised in garden lands. The breeders of the Kangayam tract will be adding good feed in this crop when pasture is scanty. This is also a quick growing green manure crop. An attempt is made in some parts in the Amaravathi valley to raise this.

Guinea grass can be easily cultivated in wet areas and in garden punjas. This is also a good fodder crop for milch cows. Its special excellence consists in its being perennial. This is usually raised from clumps.

In all the pasture areas throughout the Kangayam tract there is rank growth of "Velvelan" trees. The leaves and pods are eaten by cattle with great relish as they are very nutritious. In some parts along the Amaravathi and the Cauveri valley babul trees are found. The existence of "velvelan" trees in large number in pastures affords shelter to the cattle grazing therein day and night.

When the animals are stall fed fodder is thrown among the animals which soon gets trodden and soiled. This should be fed in troughs or proper mangers. No animal however hungry it may be, will eat fodder thus soiled. The trough or manger should be cleaned daily especially when green fodder is given. The fodder that may be thrown in trough could be completely made use of by cattle if these are cut into small pieces by chaff cutters. This is attempted in a way by the Pattagar of Palayacottai. For want of manger, all over his cowsheds and vacant sites, where the animals are tied to pegs, fodder is considerably spoiled.

During the grazing period for nearly 7 months Purattashi to Pankuni (October to April) the cattle roam about in the pasture grounds in wild state; drinking water is available in ponds and wells inside the enclosures. There is sufficient supply only in winter months. Breeders experience considerable difficulty in summer for watering their cattle. Even the Pattagar of Palayacottai has not made proper arrangements for supply of pure water to his livestock in most of his pasture grounds. The big sizes of Mysore and Alambadis are due mainly to the waters of the mighty Cauveri. It is worthy of note even in the hill villages where there is good pasture the animals are found invariably of stunted growth whenever there is difficulty for getting pure water. 'Arabakeri' and 'Dintalle'—the hill villages about three miles from the Cauveri are famous for their big sized Alambadis by their watering in the river and only from these villages stud bulls are purchased by hillmen. Chengadi another village in the Kollegal Taluk only about three miles from them and about 6 miles from the river with no access to it have only cattle not even up to the stature and size of ill-bred country animals.

I have been impressing upon the Pattagar and other breeders the necessity for going in for pastures adjoining the Cauveri and the Amaravathi.

For 'Thai Pongal' wherever the animals may be for grazing they are all taken to the respective breeders' houses and after washing them they are stall fed. Animals intended for sale in the Kannapuram and Tiruppur Fairs are selected and separated from the general breed and the rest are sent back again for grazing for two months more. Such animals are fed with special green stalks and pulse pods etc., for a time and gradually they are given concentrated food, consisting of cotton seed, and ground-nut cake. The nearer the fairs approach the better the animals are fed. In addition they are given the best fodder available throughout the day and night.—e.g. Cholum fodder, pulse pods and Kolukkattai hay. The animals during the stall feeding pick up flesh and develop rapidly from day to day and they become docile as they are kept tied throughout this period.

Every ryot keeps his cows and other cattle in his own fields fenced and he parts with his young stock at a very young age. In the case of big breeders the cows with calf at foot, dry cows, heifer calves, young bulls and castrated animals for sale and working animals are grazed separately in different pasture grounds separated from each other by proper fences.

The small breeder takes more care of his promising young calves. The calves are allowed to suckle as much milk as they can for the first three months. It is a great mistake to neglect calves. The greatest growth takes place during the first year and it is during this period special care should be taken to build up the frame of the young calf. Throughout the Kangayam tract only bull calves are taken proper care of. Breeders take special care of the male offspring as they get fancy prices.

Housing. Throughout the Kangayam tract provision made for the sheltering of cattle cannot be considered in any way satisfactory. It is not customary to afford shelter against sun and rain. The cattle

are protected in a way by screens of bamboo and wild twig pens. These are moved at intervals from place to place in a field and in this way the whole field is manured.

During the period of hand feeding in the Kangayam tract no attempt is made to secure the valuable manure in urine. It appears necessary that even a big pasture ground where the animals are allowed to remain exposed night and day for months should be provided with cow sheds to shelter them at least during heavy rains. Nothing like protecting them against heavy rains and cold winds. I take this opportunity of moving the Agricultural Department to advise the breeders in the Kangayam tract as to the necessity of putting up model cow sheds with all improvements found necessary for housing the cattle and for securing the farm yard manure in the best way possible. In the rules framed under the Agriculturists' Loans Act, there is no provision for state aid for such construction, the most important and necessary thing to be attended to in the improvement of live-stock. This rightly comes under the agricultural object. Unless specially mentioned and extended the needy ryots cannot expect to get state aid for construction of their cow sheds from the Revenue Officers who adhere to the letter in the working of the Loan's Act. With such a support the breeders may not find it difficult to put up proper cow sheds wherever necessary.

Both the cows and working cattle are tied exposed throughout the Kangayam tract. How far such an exposure would affect cows in special I need not tell.

"Eye of the master fattens the cattle". The truth of this proverb is amplified well by the care taken by the Pattagar of Palayacottai in the rearing of his cattle. He will be seen from sunrise to sunset and even late in the night in his cattle pens moving from place to place seeing to the proper feeding of each and every one of his livestock. He can tell to a day the history of each of his animals in whatever pastures they may graze or in whatever pens they are stall fed. In the Kangayam tract all breeding bulls are private property of big breeders most of whom do not allow petty

breeders to have their cows served by them unless the male offsprings are sold to the owner of the bull. Of late *in breeding* appears to have become less common and now breeders often buy their breeding bulls from the Pattagar of Palayacottai. Nowhere in the Kangayam tract a breeder could trace the pedigree of bulls for more than one or two generations. This is the case even with the most advanced breeder—the Pattagar of Palayacottai as no pedigree register is maintained by him. Cattle if moved when young get acclimatized more quickly and this susceptibility of cattle to changes of climate should be borne in mind in attempting to improve cattle by supply of breeding bulls. Bulls for breeding should be got in pairs so that one may be an inducer to the other. Both can then be useful as breeders and workers. The Kangayam stud bulls found in Tinnevely and other districts were all grown up animals when they first arrived so that they could not get easily acclimatized and from day to day they were declining in strength and failed to be good stud bulls. The bulls were entrusted to Village Munsiffs and private persons and as a rule these were not taken proper care of by them. It is expected ere long every Government Farm, every Veterinary Hospital, every Grazing Panchayet and every Rural Co-operative Society where there are large number of cows may be provided with proper stud bulls. There is provision for state aid under the Agriculturists' Loans Act for purchase of stallion which does not form part of the Agricultural stock of the country. This should be advantageously extended for purchase of stud bulls as cattle are the backbone of agriculture in the province. In the Pattagar's herd, there is always a stud bull with milkers. The moment a cow is found in heat the bull is taken for service. Unless a cow calves once a year there can be no good profit for a breeder. During the last visit of Pattagar's livestock a cow was shown which has conceived in second month after calving. The Kangayam cows generally conceive in the third or fourth month after calving. Some yield milk during the whole period of pregnancy. In such cases they should be dried at least two months prior to calving so that the mammary glands may have rest and the formation of new milk may go undisturbed. It is usual to have a stud for every 50 cows. Grey colour shows hardihood.

It is better to go in for this colour both in heifers and bulls. A heifer should not be allowed to become very fat lest it becomes barren. One may start breeding with a fresh set of animals; a good pedigree bull calf with a few good heifers of proper breed well suited for the locality should be procured. The younger they are the easier it is to get them acclimatized. This applies equally to the Kangayam and hill calves. This is my experience. It is a bad investment to go in for adult animals. Among the calves born in a herd the best one should be used for breeding. By continuing this process the herd will be considerably improved as we see in the Pattagar's livestock. In the case of one who has already a herd and desires to improve the same he should secure a good stud of the same type better formed and large sized. No other bull should have access to the herd.

The crude method of castrating with wooden rods or balances is still in vogue. This is commonly resorted to even in the Pattagar's livestock. This is not complete emasculation. It is safe, easier and less painful to cut open and remove testicles completely with knife and then treat the operated part with antiseptics. This may be done when a year old or even less, say three months old. Bulls not intended for breeding should be castrated before they develop any breeding propensity. With the opening of the Veterinary Hospital at Erode it is hoped that breeders may resort to this western method of castration in preference to the cruel mulling process. The Pattagar has recently castrated some of his stock.

Cows are worked in some parts in the Kangayam tract for mboting, ploughing and other draught purposes. There is no reason why they should not be used so when dry and until they are within two months of calving, and fed and looked after well. This practice is in vogue in other parts of Coimbatore and in Salem district and deserves further extension. It is a pleasant sight to see in the Kangayam tract women driving mbotes, ploughing and attending to other agricultural operations. In the Kangayam tract the women mostly look after the livestock.

Shows and prizes. Kannapuram is situated in the heart of Kangayam tract surrounded by fertile breeding centres. The Chitra Pournami cattle fair at Kannapuram being the first annual fair, the pick of Kangayam cattle are brought in large numbers for sale. Only the animals remaining unsold are taken to the Tirupur Show which generally takes place a month after. Cattle Shows to be of any value to the country should be in the centre of cattle breeding areas like Kannapuram and the ryots and breeders that attend the show should be stimulated to choose better stud bulls and workers and to know what sort of animal is the best.

In conclusion I urge that the pressing need of the country towards the improvement of cattle is increased facilities for proper rearing and housing of cattle and supplying of pedigree bulls and extension of private grazing grounds.

***“The Indian Village—How to improve it.”**

The problem of a country is the problem of its villages. Tell me how your villages are, and I will tell you how your country is. The prosperity of the village is the prosperity of the country. John Bright says, the nation lives in the cottage.

The few educated people with their borrowed but ill-suited fashions and noise on the platform and in the press, are not the whole nation. They are not solely the leaders that, they think, they are. It is the villager that mostly shapes the destinies of the nation. It is he that represents the true civilisation, the true character of the nation and not the English educated man who neither retains all that is best in the civilisation of his own country nor has assimilated what is best in the civilisation of the west. The latter has been talking much of late years about the need

* Paper read by Mr. Balakrishna Murthi, (Diplomad in Agriculture) on 11th July 1915, before the College Day and Conference.

of raising the village, but what has been done? Very little indeed. He cannot, therefore, be relied upon for that steady co-operation which is necessary for the great work of improving the village. Far from being the man to educate the villager he has himself to develop many of those virtues which have all along characterised the village society, its communal life, its resolute purpose of mind, its naturalness of life. The village has all the elements of progress and, if only they are rightly understood and built upon, immense progress is possible there. Let us first understand the characteristics of village society.

The Indian village, as any other village, is conservative. Even the English villager, who is far better informed than the Indian villager, still retains much of the past. The Indian village of to-day is not very different from the village of the far-off to-day. The new forces at work in the towns, the new ideas which are finding their way into the village, have not been able to change the fabric of its society. The place is very small. The doings of every individual are in the notice of all. Nothing that is exciting, breaks the monotony of its life. Their occupations are peaceful and simple. There are no rewards of life which competition bestows. There is thus no clash of interests. They are cut off from the rest of the world. The level of their general knowledge outside their bounds is perhaps low. There are in their life none of the artificialities and uncomfortable, unclimatic, unnecessary conventionalities which degenerate and devitalize what are called the polite circles in towns and cities. "God has made the village, and man the town" applies with as much truth to society as it does to natural aspect. There is a dearth of those adjuncts to comfort and culture, as medical aid and higher education which can be had only in towns. The great inventions of applied science which are the handmaids of human progress and comfort, are clean outside the range of villagers' knowledge. The units of village society are sympathetic, they cannot help

being so. Theirs are the blessings of communal life. Their concentrated action is an example to those who would educate them. Even in the town the masses have that great virtue. That is illustrated in the way in which they collect money for the celebration of the great festivals in honour of their gods and goddesses. They raise the money, every pie of it, from among themselves. One man to command, and the rest to obey; the cricket field has not a better discipline to show than the harmonious united action of the villagers on festive and solemn occasions. The villager who has knowledge in any degree higher than the average villager is looked upon with respect. The shastry vadhyar who has read more than the rest is the leader of the village. He is their judge, philosopher, guide and all. These are among the more conspicuous features of village life in India.

It is these that have maintained so long the vitality of the village commonwealth. If the village is self-centred, complete in itself, it is due to those characteristics. It is a unit of administration and that is due again to the same. The villager who has not come under urban influences, takes his disputes to his head,—his uncrowned prince, his jurist, his legislator and all.

These must be borne in mind in planning any scheme for the improvement of a village. No reform can be a success there which is not based on what is peculiarly its own. No attempt should be made to supplant anything already existing. All that is to be done there, is to make a new thing understandable to the leader. Co-operation is manifest in their agricultural operations—ploughing, sowing, after cultivation, irrigation and threshing. It is there in a more genuine and perfect form than in towns.

One of the rules of their society is, that, if there is a death in a house, nobody in the street should eat till the corpse is disposed of. They co-operate in combating a common evil. If co-operative credit societies do not succeed there where else can

they? There is the greatest need for them and it will be seen that the only practical amelioration or salvation of the indebted peasant lies in his obtaining the necessary financial aid. There is no need to tell them of the disabilities they are labouring under in their agricultural operations for want of cheap credit. If the societies are not the success they ought to be, there must be something wrong with the workers and not with those who need the societies most. Writing on agricultural co-operative societies and banks Mr. D. E. Wacha, the great Indian Economist observed:

“It is superfluous to remind careful students of economics that what are generally known as credit co-operative societies are of a variety of character and for a variety of purposes. Among these are no doubt credit societies for the benefit of assisting the ordinary agriculturist in obtaining seeds and manure, ploughs and other agricultural implements for carrying on agricultural operations. But another and more important object is the relief of agricultural indebtedness which alone is at the root of a great deal of misery and distress from year to year among the peasantry. It should however be understood that, broadly speaking, the economic conditions prevailing in an European or American peasantry greatly differ from those current in India. Even in the country itself the normal conditions discernible in each province vary. In the circumstances, India for purposes of Agricultural Relief, is a continent distinct and apart by itself and needs an organisation, which can be practically conducted on lines in harmony with the economic condition as well as the feelings and sentiments of the people of each province. The mamul or usage should be freely borne in mind, for in engrafting on these provinces a foreign system of relief for indebtedness, it is highly essential to proceed on these lines of least resistance at any rate until the exotic comes to be familiarised and its benefits concretely felt and assured.”

It must be remembered, that the villager has little imagination to appeal to. There must be something concrete before his eyes. Some people must start a co-operative bank in a village and run it and the people must actually have the benefit of the bank. Local capital may then be made to flow into the enterprise they have seen the good of. If one village has done that, the neighbouring villages will follow suit. It is no good concealing the fact, that one village copies another village with greater readiness than it does the people from the towns whom they look upon as almost another species. A bank may be started with government money, the people made to handle it under official guidance and safeguards. Nothing will please the village leader better than that trust. He will be managing and disbursing government money, his Government trusts him, his neighbours thank him. He will be furnishing accounts as the Kurnam does for the revenue he collects. Official control should of course not mean official delays as are found in granting loans under Agriculturists' Loans Act etc. The officer is there only to see that the money is safe and to hear the complaints of the people. If the village head represents the House of Lords, the ryots are the Commons, each controlling the other, the power of the latter consisting in reporting all irregularities to the officer. When the people have seen that the bank is a blessing to the borrower and the lender alike, the Government may, if necessary, withdraw their money, and the local capital will certainly take its place. It is then that the other objects of co-operative credit societies can be thought of. The numerous mushroom Provident Funds and their disappearance, have made the villager less credulous and more wary. The lost ground can be recovered only by those methods which make them feel that they are the prime factor of their own advancement and that they have the protection, direct and immediate and easy, of the Government. The Government who have left many Local Boards under non-official control, may not find it difficult to show that much trust in the village leader

In effecting improvements in Agriculture, the same is the road to success. Demonstrate. That alone, would not, however, do. The improved implements of agriculture and water lifts may be demonstrated. But there seems to be an impression, that they quickly go out of order, and that, where they do, it is beyond the skill of the village mechanic to put them right. Where is the good of demonstrating unless they turn out better work than the old things? Add to this the vast difference in price between the primitive and the improved implements. To induce the ryot to give them a trial, it is necessary that the period of their serviceableness must be made clear to them. The manures stand in the same difficulty. They are too costly to induce the ryot who is content with the manures he gets cheap or for nothing at all. They measure the usefulness of a thing more by what it costs them than by the savings it may bring them in the long run. They may be shown the superior produce of scientific manure and superior seeds. But their illiteracy makes them difficult of understanding the arithmetic needed for comparing the commercial values of things. Matters are not, however, more encouraging with the educated classes. They invest their money in lands and banking. They think it the safest and the best investment, and do not trouble themselves about new things. Such of them as have large lands, are mostly content with the primitive plough and manures. Some are known to have induced their ryots to use them. However, even those who speak of the advantages of the scientific methods of agriculture, do not seek to profit by them themselves so long as things do not promise to change for the better and so long as the demonstrations are not likely to be productive of any or proportionate good. A Zamindar here, a proprietor there, may buy a plough of the improved type. There it ends. It never goes into the fields, and if turns the soil, it is only to make a show and no use of it. This clearly indicates what the agricultural associations have done till now.

If scientific agriculture is to make any progress in India, there is a demonstration of a different kind. An acre or two must be secured in the midst of the holdings of the ryots by those who have the real and sincere object of improving the condition of the Indian ryot, and the old and the new methods and things must be shown there, and their results proved, by juxta position. The ryot is always stuck in his business and cannot find it convenient to go a mile or two to see a model farm. And what even if he goes and sees superior things and superior results? The old difficulty is still there,—he cannot afford the initial expenses, and when he can, he fights shy of what appears to him, a needless bother of a new thing. Not so when the new things are working in their midst, day after day and year after year. They move together, the conscious teacher and the unconscious pupil, and it can be shown that the results of the improved methods and things are commensurate with the outlay. This is the right sort of demonstration now advocated and carried on by the Agricultural Department but it is impossible for the government to undertake such work in each and every village. The Agricultural Department expects the kind co-operation of the rich landlords in this gigantic work of uplifting the present condition of the rural classes.

There is another way of gaining a fairly good ground for scientific agriculture. It is by opening schools for farmers' children alone. That school should be located in the fields; agreeably to the saying of professor Wrightson "agriculture is to be learnt in the field and the fold but not in the lecture room and the laboratory hall," and it should have a small farm large enough to demonstrate the advantages of everything relating to scientific agriculture. And the arithmetic that the students learn, should enable them to solve the questions of agricultural reform from a commercial point of view. The hours must not clash with the labour hours and lessons should be simple concrete and rigidly practical. It is enough if one generation is trained. When the boys grow to wield an improved plough, certainly that will be the plough the merits of which they have seen for years. Once the new system gains ground in the heart of their holdings, it will be copied by the

neighbouring farms and villages. If one generation is in for the new system, it is sure to run through posterity. Such schools may be opened and worked sufficiently long only in select centres, in the middle of a cluster of villages or at least some of the present rural schools may be modified and improved to meet this end. In the space of ten years those schools will have done the needful, and they may be even removed, just as the stove may be removed in an oil engine when the vaporiser is heated. The value of that rural education cannot be too much exaggerated.

Again, everything must be done to encourage the farmer, to keep large flocks of sheep wherever possible and poultry, the flocks for manure and poultry for the market. It is seldom, if ever, that one sees a shepherd with a flock numbering a thousand.

What with large flocks for manure the poultry for the market and cattle for the plough and the dairy, all for the improved kind of business, what with easy credit at the doors of the ryots, it may be expected that there will be a village of well-to-do farmers, intelligent enough to be amenable to industrial plans, the industries having reference only to the produce of the village, rice mills, huskgrinders, dairies, oil-mills, sugar and jute mills, etc. Cottage industries to provide work when outdoor work is not possible owing to stress of weather or during slack season must be initiated. Caste guilds must be started if the village is in a state not fit for cosmopolitan association. That is the ideal village, to which a few agricultural schools and credit banks will hasten things in a decade or two. A village with its enterprising, thrifty, intelligent and prosperous farmers need be no chimerical vision. Several families in the Godavari and Krishna deltas already belong to such ideal villages and one village of that kind will give birth to another and yet another, till the whole district is raised; and that is a result which will justify any expensive schemes, for, it goes without saying that the total prosperity of any country depends primarily on the agriculturist.

Co-operation and Agriculture.

I am highly obliged to Mr. Krishnamurthi Rao and, through him, to the Madras Agricultural Students' Union for having allowed me, to place a few thoughts before you on this occasion, touching the relationship that ought to exist between the Department of Agriculture and of Co-operation. That means things are not quite what they should be, and it is needless to mince matters. Both these labour pretty much in the same field of activity—the Rural side of India. Both have similar or same aims before them—that of making the ryot thrive. We differ only in the means employed. Your aim is to better Agriculture and you set before yourselves the finding out of methods by which the soil may be improved, the supply of water ensured, the manure made nutritious, the implements rendered efficient and cheap, the seeds 'fattened,' noxious weeds and 'puchis' exterminated and the labourer's toil rewarded with bumper harvests. We propose to find for the ryot the *wherewithal* to do all or some of these things in the usual course. You make various kinds of experiments to ensure particular results and, when you are satisfied that this or that measure may safely be recommended to the ryot for adoption, you send out a subordinate or two to persuade people here and there to adopt your ways. Generally, the adoption of these ways means money and we trouble to find *that* for the ryot on fair terms. We were both born about the same time and are of the same age now.

In these circumstances, therefore, one would expect us to have already arranged to co-operate with each other and ensured highly beneficial results to both. But what is that we have been doing till now? We have been systematically ignoring each other's existence and have at best fought shy of each other.

*Paper read by Mr. C. N. Krishnaswami Iyer M. A., L. T., before the College Day and Conference on 12th July 1915.

Missionaries of agricultural improvement have spoken and written about various matters—Single seedlings, Green manuring, Fish manure, Cambodia cotton, Sugarcane of rare virtues, Fungus diseases, spraying of vitriol and all that sort of thing—but, in most cases, there has not been so much tangible result left behind as could fairly be expected, because there has been little of *system* in this propagandist work. To speak to the ryots assembled at a cattle show or to a few absentee landlords gathered at an agricultural Association, once in a way, can hardly lead to any permanent good, and so far it has not been possible for you to do otherwise.

We, on the other hand, have had our attention confined to finding the wherewithal for the ordinary ryot to exist—to supply money for his small but vital needs, to enable him to live while the crop is growing, to buy a pair of cattle if he needs them, to pay his kists, to free himself from prior and usually oppressive debts, to do some petty trading or artisan work or to marry if he likes. Here and there our money buys good seed or green manure, but that is a rare exception. It is therefore clear that we have not cared to realise your existence either, although both have been working so close to each other. It certainly looks strange, but is none the less true.

I call this a *Pindarce* state of existence. That may be a necessary stage in the growth of every institution, but the time has surely come for it to give place to regulation of some kind, as between ourselves. I accordingly venture to make a few suggestions for your consideration and, if you find them worthy, for translating them into action.

First, with regard to experimenting. The Central and other Farms scattered over the Presidency are doubtless doing much useful work and in course of time the effect is bound to be highly beneficial to the agricultural interests of the country. But you

know best the limitations under which the *Sircar* agency has to work and its strong and weak points. They need not be detailed here. It is not hereby meant to cast reflections on all or any of the estimable persons who 'run the show' now—farthest from it. I happen to have the pleasure of close acquaintance with several among them and I know they are actuated by the best of motives in all that they do, and labour in very truth *con amore*, but they cannot rise superior to the limitations of the system in any case.

Experiments conducted solely by means of departmental agency, therefore, have at all events to be supplemented by those undertaken by intelligent ryots here, there, everywhere, though under the lead of experts, if results should be reliable and useful to the ryot class. This is not *my* idea but an opinion deliberately expressed by one of the best experts at Pusa. Only that gentleman lamented the absence of pliant human material here to co-operate with experts. Well, I am here today to urge that the human material needed does exist and exists in a fine and ready form, and you have only to make use of it. *It may be found wherever the Credit movement has succeeded* in establishing itself. We have now got nearly 1500 Credit Societies scattered over all parts of the Province and among them you may at least count a hundred or more whose Panchayatdars are the sort of men you want. Approach them and make a beginning—I can assure you it will be under the best of auspices. Only, let not the expert forget what I call the 'milk-before-meat' principle of presentation in dealing with these men. Time was when experienced administrators deliberately wrote that there was not one honest man among our rural folk, that mutual trust was unknown among them and all that kind of thing. But now we may all be glad to note that that assertion has been proved unfounded and that this Presidency is better fitted for the spread of the Credit movement than many countries of the West!

As in the case of the Credit movement, so in many others. Several suggestions are now in the air to revive Rural Life—the constitution of the Village Panchayat or rather its re-constitution, and the management of several items of village administration through it, such as Village Sanitation, Village Police, Justice, Village Forests, &c. I only add one more—Experimenting in Agricultural matters *to be carried on by means of Village Panchayats*. I can give names and point to places where a beginning may be made with high hopes in simple experiments, touching seed varieties, manuring, rotation and the like. Put them in the way and make them attend to one or two things at a time, and you are sure to be rewarded well. Proceed from simple to complex, and you will be proceeding on right lines.

It is just here that some bit of plain-speaking is needed and friends must excuse me if they find it gall and wormwood. The worst of tyrannies, once said the late Mr. Stead, is the tyranny of experts, and I fear there is ample justification for it if we look about us. Experts do not cultivate sympathy and, in the lower ranks at all events, their heads often touch the stars. Take, for instance, the case of an irrigation channel under a P. W. D. subordinate. He believes so strongly in his 'system,' his 'gallons,' the diameter of the supply tubes and other such apparatus—all based on fine mathematical calculations—that he will rather let a whole harvest go to waste than alter some plan to suit unexpected contingencies! And so with other experts also. I seriously propose therefore that every technical college must provide for some training in what may liberally be called 'humanities,' that those who go out of it may be somewhat humane in their ways.

The College of Agriculture was, I have reason to think, conceived and worked in this same narrow spirit once, but all that, one is sincerely happy to see, has since altered and the new race of experts turned out by the present Institution, have

every chance of doing well, for they are, I know, being trained *to inhale first and then to exhale*, and this makes a world of difference. It is a good—old rule to follow, and I believe you are on the whole inclined to follow it. Whatever the merits of abstract Science, it is of small use to the ryot if he cannot adopt the suggestions which Science approves. He wants not indeed to live in the best possible world, but the best possible for him. And whatever effort we make in this behalf must be subject to that limitation. This means that a careful process of taking it must be gone through before you give out. Nothing is easier, for instance, than to call the ryot names and pull his methods to pieces. But, when a Dr. Velincker tours round, he has so many good things to say of the Indian ryot and his methods. Experiments have therefore to be conducted on the basis of what exists and what is possible, and for such experiments to be successful, the co-operation of intelligent ryots is, I believe, the first essential. The Credit movement, let me repeat, has brought a number of them forward and the time therefore has come for you to enlist their sympathies in this direction. Make them begin on lines agreeable to them, and you have every chance of doing the right thing by the right method. Set before them, on the other hand, things which are not quite clear to them, though sun-clear to you, you go the wrong road. They may oblige you so far as to make some mechanical effort but, their hearts not being in the business, the experiment ends in nothing.

The single-seedling method in respect of paddy transplantation is a case in point. It was proved to the satisfaction of many ryots that it would be the right thing to do if you wanted fine harvests and some saving. But the ryot turns round and asks what about the fodder value of the stuff? That is an important question—that one of the important bye-products of paddy cultivation suffers. You will have to satisfy the ryot how

this defect is to be remedied or you may be sure he does not care for the experiment.

Similarly in every other case. All our experiments must be considered in their bearings upon the existing position of affairs, with a view to improve them, lest they easily become or be regarded as ludicrous. Fools always need the compliment of being consulted and, if we fail to give it, we are easily made fools of. Misrepresentation is most easy in agricultural experimenting and sound methods may easily be described as those meant to extract sun beams out of cucumbers or grapes out of thistles. So much for experiments.

Next in regard to the important subject of Agriculture. Now that a net work of departmental institutions has been organised over the whole of this vast continent, there ought to be thousands of opportunities for comparing notes, and for frequent publication of reports and leaflets and pamphlets. As a fact, you have done and are doing a lot that way—the Calendar, to name only one. As yet, however, you have not found the right agency to place information before the ryots as it deserves to be. To ask the village munsiffs to circulate the papers among the people of the village—you all know what it means. On the other hand, where the Credit movement works well, ask the panchayet to help you and they will do it infinitely better. When people meet for banking purposes, leaflets can be read out and assimilated in a spirit which no village munsiff can infuse. Where, on the other hand, the credit movement has done well, there the reading room quickly comes in and the village schoolmaster is found busy reading to the ryot. That is a capital organisation for the spread of agricultural knowledge and you will not be justified in ignoring its existence. Your aim stands a good chance of being steadily, if slowly, realised in case you ask credit societies to co-operate, not otherwise. As a small instalment of what is sought to be urged here, the Coimbatore District Urban bank which has

got relations with all parts of this district and with Malabar and Nilgiris, has provisionally agreed to distribute green manure seed and has done some sale also. Now imagine most of our important villages provided with credit societies, as they are bound to be in course of time, and each R. C. S. providing green manure seeds for its own consumption, and the District Urban Bank serving all these societies wholesale—I trust you will agree that there will then be a system about it which no other alternative plan of yours can give. Similarly with regard to sale of good seed, of implements, of new plants and to diffusion of knowledge. It is a great thing to have an organisation ready to help you, and that organisation we claim to have already found for you. Co-operation as you know covers a much wider field than yours, and so properly speaking you must be content to serve as its handmaid. So far from it, you have been indifferent to its existence all these years and show no sign of bettering your relations with it.

As one instance of the unfair treatment which co-operation has received at your hands, I cite the small presence of books on co-operation in your Library. Now I ask in all seriousness if this is as it should be. I call this specialisation with a vengeance and it seems to bear a close resemblance to that unfortunate illustration on division of labour with which Prof. Walker begins his political economy—viz. that a man can be a Chemist and sell deadly poisons, but at the same time has no right to say that concentrated prussic acid is death to drink! Please therefore let your library extend its arms to a few books on co-operation. Just a few, mark you, to give experts in Agriculture an idea of how best their expert knowledge may fructify with the aid of co-operation. I have not a clear idea of the curriculum of studies as it at present obtains in this college but I am told it is eminently, practical and I am so glad to learn it is so. That is just the reason in my opinion for the addition of a little bit of co-operation as part of their stock, and perhaps a little bit of land tenure as it obtains in our own parts. It is merely

a suggestion, which may be taken for what it is worth, coming as it does from a non-expert. I half-recollect having heard from someone that these things are already included in the curriculum, and provision has been made to give lessons on such subjects. I shall be satisfied if the authorities agree that they are essential and see that some thing more is done for them.

If Co-operation and agriculture learn to help each other in the two great lines of experimenting and propagandism, many other useful results may be expected to follow in the usual course. Common purchases and sales are the most obvious. Cattle breeding, poultry breeding, bettering of dairy products, market gardening, cattle and other insurance, increased use of machinery—all can be improved indefinitely if we agree to work together and help each other. Anybody who cares to read Mr. Wolf's Co-operation in agriculture, finds what a vast field for improvement lies before us, if we but care to stand united and work.

I feel I have tried your patience long enough and shall be glad to stop here. You will observe, I have not said a word about the marvels which co-operation has wrought among Western people—conditions are so different. Here is however the conclusion of an English writer on Co-operation. After having at great length considered Co-operative Societies formed for this or that purpose, the writer concludes :—

“Europe is an old and thickly populated continent, and its cultivation is becoming more intensive. The opening of Trans-Atlantic markets within the last half century or less, has tended to confine Western Europe just to those forms of intensive cultivation in which small farming is strongest. Meat, wool and cereals are being imported in increasing quantities from other countries; and their place is being taken by costly products or by products requiring immediate consumption or consumption close to the place of production; that is to say, the range of the small farm specialities and the range of the cultivation into which the development of the world's markets is forcing Europe, approximate very nearly to one another.

We may therefore present as our broad conclusions (1) that statistical evidence proves the vitality and slow expansion of other forms of cultivation than what we call distinctly big, and in particular of small cultivating ownership; (2) that the province of small-scale farming is permanently assured and capable of expansion; and (3) that this expansion is directly stimulated by the trend of international agriculture. Combining these results with those of previous chapters, in which we have shown the supreme importance of Co-operation to the small farmer in particular, we may submit that Co-operation is not only *a* but *the* corner-stone in the development of modern agriculture.”

Mutatis mutandis, this conclusion seems to me to be true also of the continent of India and of the ryotwari Province, which is ours, in particular. If so, do you do well, I ask, to fight shy of us? It is doubtless your immediate care to make two blades of grass grow where there was but one, and put two grains into the ryot's store when he has to be content with one now. But surely this bettering of production is one of many links in the chain of modern Economics, and he who would really better agricultural production, has to look about him and find how this bettered state of things, he has in view, fits in with the course of Industrialism as a whole. If it does not fit in well then, depend on it, the very efficiency which you labour hard to bring about, may become your bane. Accordingly, I believe I have made out a case for the study, by the agricultural expert, of the element of Economics and of Co-operation in particular.

Easy method of preparing lime manures required for Tanjore paddy soils, through Co-operation.*

The Research Institute attached to the Agricultural College, Coimbatore has analysed samples of soils in the Tanjore Delta taken at

*Note read by Rai Sahib Mr. A. Sethurama Iyer, Diplomat in Agriculture, before the College Day and Conference on 12th July 1915.

five miles apart. It has been found out that *phosphates* are wanting in almost all the samples of soils analysed.

"A soil containing about 700 lbs. of available phosphates per acre within the first 9 inches would probably show about 3000 lbs. of total phosphoric acid both available and unavailable to the plants. Of the 700 lbs. of available phosphates, a crop of 1000 lbs. of rice per acre removes from the soil only 3 lbs. to the husk, 4 lbs. to the rice and 3 lbs. to the straw. The gain of phosphoric acid by silt deposition is a good deal more than the outgoings and it is only where no silt deposit takes place that the question of recoupment of phosphoric acid would be considered."

In the Cauvery there are many dams and regulators in the way. The silts are deposited then and there where there is an obstruction. The irrigation water reaches the fields in a clean condition. Owing to the continuous cropping of paddy and the absence of silt in irrigation water, Tanjore soils are losing their phosphates. So, it is necessary that ryots should make good this loss by applying phosphatic manures to the soils, such as bones and superphosphates.

Bones may be used in various sizes, such as $\frac{1}{2}$ inch bones $\frac{1}{4}$ inch bones, bone dust etc.

In the Tanjore district about a lac of cattle either die or are slaughtered every year. The bones of each animal (cattle) will weigh about 40 lbs. That means about 4,000,000 lbs. or 1800 tons or about a lac of rupees worth of bones are exported to Ceylon. This export can be stopped a little by co-operation. The bones can be collected by a co-operative society specially organised for that purpose, crushed by means of a disintegrator and the dust used as manure to the fields. A co-operative Society consisting of not less than 10 members should take shares for about Rs. 2000. With this amount they should purchase a five horse power oil engine for about Rs. 1000. A disintegrator for about Rs. 340 etc., The whole machinery for milling bones would cost about Rs. 1500, and construction of shed etc. would come to about another Rs. 500. This society should borrow as a

joint loan from the District Bank about Rs. 5000 in a year for working expenses. A ton of bones costs about Rs. 50 in the Bombay Presidency. In the Tanjore District, bones can be procured at a very favourable rate at Rs. 40 a ton. For 100 tons about Rs. 4000 may be required. A 5 horse power oil engine would give one ton of bone dust ($\frac{3}{16}$ ") costing about Rs. 80 a ton in a working day of $8\frac{1}{2}$ hours. So there is a sheer profit of Rs. 30 per ton in making bone dust. Deducting expenses for crude oil, cylinder oil, shafting oil, driver's pay, boy's pay, wear and tear and interest on the outlay, we can get a net profit of Rs. 20 per ton of bone dust produced.

The Department of Industries would help as regards installations. Further there are now about 129 oil engine installations in the Tanjore District of which only 9 are pumping plants and the rest in industries (milling paddy). These installations will be without work during rainy season and owing to competition many are without any proper work. These can be utilised for crushing bones into bone dust. Only disintegrators costing about Rs. 300 should be attached to the oil engines. The oil-engine owners may derive profit if they determine to work in this new line. Not only will they be profited, but they will also benefit the ryots by supplying bone dust manure to the Tanjore wet lands which are now almost deficient in phosphates; 1 to 2 cwts may be necessary for an acre.

Notes.

The friends of Mr. K. Chinnaswami Pillai, Dip. Agric., will be glad to read the following account of him which we have taken from the Report of the Ceylon Agricultural society for 1914-15:—

"Mr. K. Chinnaswami Pillai who was seconded for duty as Foreman of the Dry Zone Experiment Station, Anuradhapura, reverted to his substantive post as Agricultural Instructor, Batticaloa, on 1st February 1915. Mr. Chinnaswami Pillai's training and experience in South India enabled him to put in some

excellent work in the laying down of a series of dry-land crops at the Experiment Station, and should stand him in good stead in the district in which he is now serving where the climatic conditions approximate closely to those of South India. Already his knowledge and advice as to agricultural practice have come to be appreciated and sought after, and some interesting schemes affecting crops and cattle are likely to be launched with his assistance."

The Pastoral Review recommends that if a few handfuls of sulphur be rubbed over the bags in which grain is stored, rats and mice will not touch them. K. C. J. (From Tropical Agriculturist.)

Mango twigs occasionally wilt away in the manner neem twigs are said to wilt in Mr. Y. Ramachandra Rao's note in the August issue of this journal. In the Pithapuram Estate Farm the writer observed in about January last year on some young mango trees almost every young twig thus affected. Some specimens were also forwarded to the Mycologist under the impression that the wilting might be due to a fungus, but no information about the cause of the disease was received till the middle of June 1914 when the writer left the place. The wilting has not so far been seen on any other tree. G. J.

Tillering of cereals, says Mr. Seeley of Tunbridge Wells, is largely the result of opportunity. The plant with a strong root hold and a fair length of stem underground, would branch more freely than that which germinated near the surface. Deep sowing of cereal seeds is, however, prejudicial to the healthy germination and robust growth of young plants and excludes the sprouting plants longer from sunlight till they come out of the thicker layer of soil. To reconcile the conditions that stimulate germination and tillering he advocates the use of a machine invented by him known as the 'mechanical tiller' the principle of which was that it pushed

the earth close to the roots of cereals sown in drills at required intervals. (Extract from The Times.) K. U. K. M.

Potash from Prickly Pear:—In the course of operations for the destruction of prickly pear on a block of 10,000 acres of infested land in Queensland, it was noticed that the ash obtained by burning 5 acres of prickly pear amounted to half a ton of 80% Potassium carbonate. Seeing that the material was valued at £22, a ton a year ago in America and has now, owing to the War and the consequent shutting up of the Stassfurt mines, risen in value to £90, it was thought worth while to clear infested land from prickly pear which it would not pay to touch otherwise, as the recovery of the potash would pay for the clearing. Prickly Pear ash contains 15% Potash.—M. R. R. (From the Chemical News).

Sugar chemically changed into Soap:—"We hear of extensive investigations that are being conducted to use sugar as a substitute for fats. . . . Sugar has potent elements of strength that can enter into the fabric of the Soap— . . . Large laundries have asserted that there were a number of advantages that had accrued from the use of sugar in soap that would guarantee a welcome to such soaps. Fine and delicate silk fabrics have been washed and the woof and warp of such garments have not deteriorated nor been affected. The colours also have not been affected but on the contrary have been enlivened. Then this soap also floats and can be used with salt water. This is of great significance to all engaged in maritime commerce.—K. K. R. ("Louisiana Planter Vol. IV.")

The Agricultural Department is responsible for bringing about a large reduction in the seed-rate of paddy in the villages near the Central Farm, Coimbatore. The usual seed-rate in the Chithrachavadi villages 4 years ago was a

Selagai (30 Vallams) or 60 Madras measures per acre. Year by year, the seed-rate has been reduced at the instance of the Agricultural Department and in the current year, over 200 acres are transplanted with a seed-rate of 10 vallams or 20 M. M. per acre. It is likely that the seed-rate will still be reduced in future after this year's experience. In the Telungapalayam village which is close to our wet land area of the Central Farm, the ryots in over 300 acres have raised dry seedbeds of paddy and reduced the seed-rates. A quantity of 5 to 7 vellams or 10 to 14 M. M. per acre is now used where formerly a much larger seed-rate was adopted. Thus the ryots of the adjoining villages of the Central Farm have been approached and successfully made to reduce the seed-rate of paddy. W. R.

It may not be generally known that Sugarcane contains in its Vascular bundles some quantity of soil water. When cane is crushed, this water is expelled and can be collected in drops at the other end of the cane. This water is almost tasteless. The average composition of this water obtained from some canes grown on Cane Breeding Station, Coimbatore is given below :—

Sucrose	...	·8 to 1·3%
Glucose	...	·03 to ·04%
Total Ash in 100 C. C. of water	...	·095 gm.
*Ash Soluble in hot water	...	·061 gm.
†Ash Insoluble in hot water	...	·034 gm.
Chlorine calculated as sodium chloride	...	·037.
Lime	...	traco.
So ₃ calculated as Sodium Sulphate	...	·013.
Potash	...	·003.

* In Ash Soluble in hot water.

† Ash Insoluble in hot water was digested in HCL. and filtered.

Found qualitatively a fairly large quantity of Lime and some P₂O₅. (K. K. R.)

Estate Notes.

Students of Class III were taken on a short agricultural excursion in the South Canara and the Malabar Districts by the Assistant Principal from the 1st to 14th instant.

Students of Class II had a short tour from 18th to 22nd in the Salem District with the Principal and the Ag. Chief Assistant.

At the conversazione held in the officer's club on 6th inst. Mr. S. Sundararaman M. A., spoke about "Rubber-cultivation" in Travancore and Cochin. In the course of his talk, the methods of cultivation, the process of extracting and collecting rubber and the preparation of rubber for market were some of the points touched upon. The model illustrating the tapping of rubber trees and the chalk drawing prepared for the purpose were very instructive.

Another conversazione was held on the 20th instant when Mr. C. N. Krishnaswami Aiyar M. A. L. T., of Coimbatore, spoke on the 'Beauties of the Ramayana.' In the course of which he drew parallels between ancient Hindu and Greek authors in which, he believes, that there is a vast field for future students to work. He also paid a great tribute to ancient Hindu authors as students of human nature substantiating his statement with quotations from the Valmeeki Ramayana, the subject of the evening.

On the 2nd instant there was a hockey match with the Kumbakonam College team, played in our grounds. The A. C. & R. I. team won the match by 5 goals to 1. The first blood was drawn

by the A. C. & R. I. team by Mr. R. C. Wood the central forward within 10 minutes of the beginning of the play who put in another goal more within the first half time. The other three goals were put in one each by students Onkaram, Dharmalinga Mudaliar and Rangasami Pillai—(Games Captain). The Kumbakonam team, however, defended the goals very efficiently in as much as the twists made by the goal-keeper's stick warded off a few strong shots.

On the 11th instant a foot-ball match was played with the Stanes High School team in our grounds. It ended in 3 goals to our credit against one for the other team. Student Venkatachalam of Class II was mainly responsible for the defence; but for him Stanes could have had a happier day. The return match was played in their grounds on the 19th, with 6 goals to their credit against 2 of ours. Samuel Nallathambi of Class I and Narasimha Chari of Class III exhibited themselves as clever forward players and our defence was very weak owing to the absence of Class II students in camp.

On the 26th of this month a hockey match was played with the Forest College team in our grounds. The play commenced very well. Our team had commenced the offensive in the first half when a rain set in and the match had to be brought to an end. It was declared draw with one goal to the credit of the Forest College team against two of ours.

The Students' Club is entirely self supporting, and depends for its funds on the subscriptions of the students themselves and other 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 Government 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.

Departmental Notes.

Appointments, etc.;—Mr. C. Madiah L. Ag., Assistant Farm Manager is posted to Koilpatti on his return from Newington (Court of Wards).

Mr. S. Pranatharthiharan L. Ag., who is acting at present vice No. 1 will, on the latter's return to the Department, act for Assistant Farm Manager V. S. Subramania Sastri, Dip. Agri., on combined leave.

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Published monthly

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Agricultural College, Lawley Road, P. O., Coimbatore.

Printed at the Literary Sun Press, Coimbatore.

THE JOURNAL

OF

The Madras Agricultural Students' Union.

Vol. III.

November 1915.

No. 11.

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

Agriculture and the Madras Park Fair.

To one who accuses the Indian as one who does not enjoy the pleasures of life, the motley crowd that annually gathers in December in Madras is a challenge. Most of them that go to Madras at this time do so generally to seek pleasure once a year encouraged as they are by the railway concessions—a very uncommon consideration at the hands of a railway company. The crowds 'do' Madras in the tram car through the day, and the Park Fair is the rendezvous of the Christmas crowds at night. There they go to see the man with two heads talk, the Indian Sandow exhibit his prowess, the magician his legerdemain or the military hotel its appetising meal. It is a thing

they look forward to and plan for months and that the crowd is thoroughly representative of the whole Presidency is proved by the babel of languages one has to put up with there. What they take back from such a fair for the silver they barter, it is difficult to know.

That there is going to be another Park Fair in the ensuing Christmas season, is beyond doubt. From what one knows it is going to be of a different kind. It is not unlikely that the light amusements which appeal to the man-in-the-street will continue as heretofore, but it will also be instructive. The War is not likely to deter the enthusiasm of the organisers of the fair. On the other hand, it will only stimulate them to make it a thorough success, as we understand the exhibition that is proposed to be held is in aid of the War Fund. The Government wish it to be made in every way interesting and at the same time instructive. His Excellency the Governor is evincing a great deal of interest and has already visited the grounds watching the progress of the arrangements. Many departments of the Government will be represented but we shall, in the following paragraphs, concern ourselves only with the Agricultural section which we hope is going to play a not insignificant part.

The Agricultural section will be entirely in the hands of the department and is bound to be run on proper lines under the able guidance of Mr. Chadwick, the Director. We learn that endeavours are being made to make the Exhibition characteristic by showing living plants actually grown there as far as possible. Different grains, maps,

diagrams, will also find a place. We learn that buildings are already under construction wherein different sections of the department will exhibit their 'wares.'

Paddy and cotton in which the department has done most work are sure to demand the greatest attention. Not only will improvements in them be ocularly demonstrated, but their products, such as paddy, straw twists, yarn, lint, oil, and cake will be on view. Matters of scientific interest will we have no doubt be in evidence, for Science which is the handmaid to Agriculture ought to come to her aid to make the exhibition instructive. The magic wand of the Economic Botanist might produce different coloured paddies at his will. Mendelism which has revolutionised the principles of breeding of plants and animals will no doubt be popularly interpreted by him.

We should not be surprised if we see an arecanut palm sticking up right in the middle of the grounds with a Malabari perched on its top, obeying the instructions of the Mycologist who with his Bordeaux Mixture has saved many a plantation from utter ruin. It is said that insects loom largely in the activities of the present day Agriculturist and the Insectary has figured prominently in a recent issue of our Journal. It is, therefore, very likely that the Entomologist will exhibit many of his too familiar but harmful insects and suggest remedial measures. In these days of high prices of cattle and the consequent necessity for intensive farming, the fertilising value of the manures will no doubt be largely demonstrated in the exhibition and we hope it will be most beneficial.

Of late one hears of many dairies springing up specially in the vicinity of large towns. We welcome this, but we do not know how far they are run on up-to-date and scientific lines. The department will exhibit their dairy plant, milk and its products and demonstrate butter making from separation of milk up to the storage of butter. Attempts are, we understand, being made to grow suitable fodder crops which are necessary adjuncts to profitable dairying.

We believe fruits will also be exhibited. This is doubly welcome; the department has not done any work in fruits but this signifies the interest it is sure to take when a suitable opportunity offers. In a country like this, where fruit is within the reach of the rich and poor alike, any improvements in them will be gratefully appreciated by all. An attempt will, we hope be made to show the various fruits from different parts of the Presidency, which in itself will be most educative. Might we suggest the inclusion of Oranges-Batavian from Palkol, Navel from Bangalore, Satgur from North Arcot, choice varieties of plantains in which the country is so rich, say, from Circars, Malabar and the South, grapes from Penukonda, the pomegranates, figs and in fact, all seasonal fruits?

We are aware of the versatility of Mr. Wood, the Principal who we believe is to be the departmental artist, and we can rely on him for subtle humour and healthy amusement in all his drawings. The onerous duties of the arrangement of the exhibition will no doubt fall on one of our Vice-Presidents, Mr. Chelvaranga Raju, and we

have no doubt that in his hands the exhibition will be a thorough success, but we trust that he will not turn grey by the time the exhibition is over.

We commend the exhibition to the patronage of our readers who, we hope, will not only be loyal to their Emperor but to their profession and derive much profit and inspiration from information obtained there first hand from the officers of the department who will all be represented. We should like to take this opportunity to warn our readers against being hypercritical, and to remind them of the multifarious difficulties the organisers have to work under. For one thing the weather may be against them but from what one sees and hears of the preparations, everything spells success, and we heartily wish them the same.

Agriculture in Cochin.*

Cochin State has an area of 1361½ sq. miles (according to the great Trigonometrical survey). It consists of two disconnected tracts—the larger one adjoins the sea-coast and the smaller one-Chittur—is surrounded on all sides by British Territory. It has a coast-line of about 35 miles in length.

The whole of the state can be divided into 3 main divisions—the hills, the plains and the sea-board. The hills which form the eastern portion contain valuable forests yielding good timber and other forest products. Coffee and rubber are grown there.

The plains lie between the hills and the sea-board. They are intersected by many rivers and streams. Here in the plains are

*Extracts from paper read by Mr. I. Raman Meron, B. A., F. E. S., Dip. Agri: (Cantab), in July 1915 before the College day and Conference.

paddy lands, grazing grounds and mixed gardens. The important rivers are the Ponnani, the Karuvannur, the Chalakudy and the Alwaye. They are perennial rivers and have a copious supply of water even in the hot weather.

The sea-board is a long and narrow stretch of land lying between the plains and the sea. This is, however, separated from the plains by the backwaters. A good portion of the sea-board is swampy and is subject to floods during the monsoons and to tides from the sea.

The average rainfall varies from 120 to 125 inches per annum and this is distributed from the middle of May to the middle of November. The heaviest rainfall is in June and July. The outlying district of Chittur does not get more than 50 to 60 inches of rain.

The soils in the valleys of the hills are very fertile and contain plenty of organic matter. Some of the best paddy lands are situated in these valleys. The dry lands or 'parambas' are mostly of laterite origin. Good loams occur here and there, but generally soils on laterite rocks become gravelly in character—the inevitable result of heavy rains. In the sea-board clayey soils do occur and these lands are invariably swampy paddy lands.

The total agricultural area of the state is 4,79,975 acres. This extent is classified as follows:—

Wet lands or paddy lands 2·06—2,05,794 acres.

Dry lands ... 2·74—2,74,181 acres.

Of the latter 1,03,806 are garden lands and 1,70,375 are dry lands. The cultivated land is divided into wet, dry and garden lands.

Paddy lands:—These include the following types. Single crop swampy paddy lands adjoining the backwaters. They are subject to floods and also to tides from the sea. The paddy in this locality stands a certain amount of salt in solution. The success of the crop, however, depends on a steady and copious supply of fresh water brought down by rain or by rivers.

Kole lands:—These are single crop paddy lands. They are cultivated in fresh water lakes from which the water is pumped out by

Persian wheels or power engines. The cultivation begins at the end of December. The harvest is in May. During the monsoons a lot of silt gets deposited in these lakes. The fertility of these soils is thus maintained.

The remaining paddy lands come under one or other of the following types:—Virippu, Mundakan and Puncha.

There are lands in which all the above three crops are raised in the course of the year. A very large extent is, however, double crop—Virippu—Mundakan. Other combinations two at a time are also common.

The first crop in the Malabar year is the Virippu and the first harvest is in August—September. Paddy is sown broadcast in May, soon after the first shower in May. Before the heavy rains the plants attain a height of 10 to 12 inches. Good farmers give a liberal supply of a mixture of rotten dung and ashes and green leaves, if available.

Virippu is also transplanted. In this case the stubbles are not ploughed in January. The land will be ploughed only in time for transplanting.

Mundakan is generally transplanted. Puncha is the third crop of the year. This is sown broadcast or transplanted. Cattle manure and green leaves are generally applied to all paddy lands. Green manuring by raising a green crop, application of manures other than cow dung and ashes, improvements in transplanting, prevention of pests are matters in which the Agricultural Department is taking action.

Paddy is the most important cereal grown in the State. Ragi and Millet are also grown. Maize and cholam are not grown on a very large scale.

Among pulses the most important are horse-gram and cow-peas. Pigeon pea is also grown on dry lands along with paddy. Green gram and black gram do not occupy large extents. One notices in Cochin as well as in other parts of the Malabar coast a certain amount of

indifference shown by the ryots towards these pulses and other dry crops. Gingelly is raised on parambas or on paddy lands as a second crop.

Rotations.—The only rotations are—paddy followed by gingelly once in four or five years. Paddy lands on higher levels carry a crop of horse-gram. Paddy in the first year, bannanas in the second followed by vegetables and paddy again is a common rotation.

I now pass on to garden lands and permanent plantations. The important garden products are ginger, pepper, turmeric and other vegetables, tapioca, coconuts and areca nuts. The cultivation of ginger, pepper, turmeric is not carried on in an intensive method. There is considerable room for improvement in this direction. The Agricultural Department is taking necessary steps in this matter.

Coconuts.—The sea-board and the alluvial banks of rivers and backwaters are all studded with coconut palms. Coconuts are flourishing right in the interior also. Cochin produces the finest copra and coconut oil. There is a very large export trade in almost all the important products from the coconut palm; while the number of people engaged in the cultivation of coconuts and in the industries allied to coconut is very large indeed. The ryot does not feel the decreased yield owing to bad cultivation, as he is obtaining better prices for the same quality. Improvements with regard to better manuring and preventive measures against diseases are advocated.

Areca-nut Palms.—These occupy an extent of nearly 15,000 acres in the whole State. In certain localities the cultivation is carried on in a very intensive style. The trade in areca nuts is mostly with the other districts of India. Other crops of importance are ginger, pepper, turmeric, yams, bannanas etc. Tapioca is grown all over the plains with profit. The extent under this crop is gradually increasing. Groundnuts have been introduced and are coming into favour.

Sugar-cane was at one time very largely grown in the State. The cultivation of canes is now reviving. Experiments with Mauritius, Barbadoes, and Coimbatore varieties have been so far successful and

there is no doubt that sugar-cane will become an important crop in the near future. The Agricultural Department proposes to give suitable encouragement to extend the cultivation of this important crop.

Live Stock.—The whole of the West Coast excepting a few localities has been notoriously behind the other districts in the matter of cattle breeding. One comes across with all types of cattle in the country. Moderately good specimens of Nellore, Kathiwar, and cross-breeds are seen here and there. The majority of the cattle are, however, mongrel types. Nearly one bullock or buffalo for every 6 acres of agricultural area is found to exist. From an agricultural standpoint the stocking is poor indeed. One disastrous result is that ryots have occasionally to hire animals during the cultivation season. The quality of work turned out is generally poor and the stock of cattle manure must of course be inadequate. Goats are common. Sheep are bred only in a few villages in the outlying Taluk of Chittur.

I have heard it mentioned in certain quarters that west coast is unsuited for cattle-breeding. Cattle brought from other districts are, however, doing very well, even in Mattanchery which has been notorious for unhealthiness.

Implements.—I have noticed that the type of the ordinary country plough varies from district to district. Some of the ploughs are very well adapted to paddy lands. How far the ryot's plough can be replaced is a matter for very careful consideration. It is, no doubt, a difficult matter to lay down any hard and fast rule, especially when we find that the great majority of the ryots are petty farmers and do not farm more than a few acres of land.

Manures and Manuring.—Cattle-dung, ashes and green leaf form the orthodox manures. The quantity applied is however inadequate. Green leaf is getting scarce. Growing a green manuring crop is not generally understood by the people. The advantage of green crop manuring is being demonstrated to the ryots in Government Farms as well as in ryots' holdings. In the coconut tracts fish refuse and

prawnskins are applied to coconut trees. These two substances are available in Cochin in sufficient quantities. Very large quantities are exported to other countries also.

Other substances which could be utilised as manures are the cakes of oil seeds, such as Pungam, Castor, Neem etc. Very large quantities of these oil seeds are sent out of the State. I think it is high time to have some sort of control over the raw-products. Shell-lime is available in sufficient quantities. There are no mineral resources in the State important from an agricultural point of view.

The general economical condition of the Agricultural class is not very encouraging. We have, no doubt, a good many peasant proprietors, but there is also another class of people who have hardly any interest in the initial tilling of the land. A large extent of land is changing hands every year. The cultivating tenant has hardly any capital and it is impossible in the nature of things to invest any money in the shape of manures.

Another feature in the economical side is the indebtedness of the ryot. A good many are in the hands of money lenders who charge very heavy rates of interest. Of late years there has been an unusual increase in wages and consequently the cost of production is greater, while the out-turn is at a minimum.

To better the condition of the Agricultural and Industrial classes, the Durbar introduced Co-operative Credit Societies a year ago. Other ways in which State help is offered are by opening seed depots and by issuing seeds at a small rate of interest and by giving Agricultural advances for such purposes as purchase of cattle, seeds, manures, implements, irrigation applications &c. The rules regarding the issue of agricultural loans are not elastic enough and the result is that the ryot is not enjoying the benefit of the advance offered. Some changes were found necessary and are being considered by the Durbar.

The Agricultural Department and its activities:—An Agricultural Department was organised in the State about half a dozen years

ago. A Central Farm was also opened. A number of experiments was done and the results were published from time to time. Owing to some change of policy the central farm was abolished and Taluk experimental and demonstration farms were opened a year ago.

A scheme for re-organising the Department is under the consideration of the Durbar.

An Agricultural and Industrial Exhibition is being held every year and every endeavour is being made to make the Exhibition as popular and as useful as possible. With a view to encourage improved methods of Agriculture, a few farm prizes have now been offered. The results of the competition will be announced at the time of the forthcoming Exhibition i.e., in next December.

Certain phases of the deltaic agriculture under the Krishna Irrigation System.*

The Krishna Irrigation System extends from Ellore in the north right down to Chinna Ganjam in the south, and from Bezwada to almost within five miles of the sea. Roughly speaking the system commands an area of about one million acres in this tract. The agriculture of this vast area comprises almost exclusively the cultivation of rice. An outline therefore of the main features of this cultivation of paddy in the delta is the purpose of this paper.

Before the introduction of the irrigation system in the early sixties of the last century the whole delta was one open flat dry country of black alluvium or regar loam and was cropped with all the dry crops such as we now see ordinarily raised in black soil tracts. There were of course here and there patches of wet cultivation under tanks which were either rain-fed, or received their supplies from the flood channels diverted from the Krishna. These lands are still known as "mamool" wet though included in the canal system.

*Extracts from paper read by Mr. T. V. Rajagopalachari Dip: Agri., on 12th July 1915 before the College day and Conference.

At first it appeared difficult to get the people to resort to wet cultivation. There was a deal of misgiving about the success or utility of a wet crop in this tract and this is only natural with a people wedded for ages to dry cultivation. Stories are current amongst old people in some outlying villages that some cultivators of the "Razu" class were brought down from the adjacent Godavery Delta to persuade and teach these ryots to puddle and transplant their crops. The system of single planting now widely prevalent in this Delta had very probably its origin in these early attempts at transplanting. The ever cautious ryot might have planted his paddy seedlings in the same way as he would do his ragi and finding that his first attempt was a success and the plants stood profusely in this rich alluvial tract, might have adopted this system in general. By the way it may be said here that this single planting even now in its true sense of the term is carried on only in the central tract of this Delta.

The success of these early attempts at transplanting being assured, the wet cultivation spread rapidly all over the Delta and today we find, with a few exceptions on the fringes in the upper reaches of the canal, the whole Delta practically one sheet of rice fields. It was a necessity in several cases in this flat Delta that when fields adjacent to a dry block were converted into wet the dry piece could not but be treated as wet, as, otherwise, the soil becomes alkaline and infertile. Thus the process of converting dry into wet proceeded *pari passu* with the spread of irrigation into the interior. The area intended to be irrigated by canals originally designed has already been exceeded and further extension is not possible.

System of cultivation:—In the course of cultivation of paddy in this tract, there has evolved a system of practices peculiar to the tract and arising out of the circumstances due to soil and climate. The soil which is a heavy black loam, alluvial or regar, contracts and cracks into deep fissures in the hot season and as such cannot bear any vegetation worth the name at this period. It swells and becomes exceedingly soft and miry with the first irrigation from the canal. The cultivation is to be carried on only in the monsoon months and must come to a close before the hot weather. Thus, there is only

one long season crop planted out in the beginning of the monsoon and gathered at the end of November. It is followed by a crop of sunhemp to be cut after 2 months and stacked for fodder.

The Telugu ryot has got his well defined seasons, and his cultivation operations are so well adjusted to suit these seasons. They are divided into 27 periods of which 13 are agriculturally important.

The ryot takes care to commence his operations in the first five periods and close them by the 15th of August. The 2nd period is the period of heavy rains and storms during which the established paddy grows. The 3rd is the period of maturity and occasional heavy showers are expected at this time. The ryot therefore so adjusts his cropping as to get his harvests after the 3rd period is over, when clear weather prevails.

Any transplantation done after the 15th of August is considered late and the crops from such transplantings are almost always indifferent and subject to disease, although a fairly large area at the lower reaches of the channels is still planted out after this date being situated as they are at the far end of the supply channels.

Seedbeds:—Unlike the general practice in the Tamil country seedbeds are invariably prepared in the dry. Soon after harvest when conditions permit of ploughing, seedbeds are broken up and kept ploughed throughout the hot season and reduced to a good tilth. About 50 cartloads of cattle manure are applied to an acre of seedbeds. The reason for such heavy application is to quicken the growth of seedlings and get the seedlings if possible even within 20 to 25 days for early planting as soon as water is received in the canal. From about the 15th of June to the end of the month is the usual period for raising the nursery. One or two showers of the preliminary monsoon facilitate the sowing of seed or a watering from the canal is given to sprout the seed. 4 or 5 bags of paddy seed equivalent to 600—750 lbs. are sown to an acre of seedbed, and the seedlings obtained therefrom are generally considered sufficient to plant 40 acres. Instances are not wanting of 50 acres and over being planted from an acre of seedlings. In such circumstances the planting is wider than usual, and

strictly in singles. Six women are found quite sufficient to plant in this way although the usual number is eight. Some of the well-to-do ryots of Gudivada and its neighbourhood adopt this method of planting successfully having got their seedlings raised with the help of wells sunk in their lands.

Exception to this practice of dry seed beds prevails in some villages in the Western Delta as also in some of the lands in Kollair. In these places the soil is stiff, alkaline and sticky and is unfit to be tilled in the dry state.

Manuring:—The manures in common use are pattimannu and cattle manure.

Pattimannu is simply village earth and in recent years much has been known about it from Departmental publications. Suffice it to say therefore that this earth is very largely resorted to by the cultivators and is highly prized for paddy lands. About 50 or 60 cartloads are used per acre at a time and the efficacy of the earth lasts at least 5 or 6 years. Of late, the earth is getting scarce and the price of a cartload varies from 12 annas to a rupee. An idea may be conveyed of the high value the ryot attaches to this earth when I mention that some 2 years ago, about an acre of patti land was not parted with, in an auction even though the bid went up to Rs. 7000/-.

Cattle manure:—The supply of cattle manure is not sufficient. At best the ryot is able to manure a fourth of his holdings with cattle manure every year. Even supposing that the effect of cattle manure lasts for two years, only half the area can be manured in this way. The ryot is therefore augmenting his manurial supply as far as possible by laying his hands on all other available sources.

Pig's dung has of late come into common use in parts of the Delta bordering the dry taluks wherefrom this manure is largely transported. Indigo leaf and indigo seed are also used in the vicinity of the Lankas. Margosa cake and wild indigo are applied to some extent. The surplus of dry sunhemp fodder is trampled in as manure in very many cases. Besides wherever feasible a green manure crop is also

raised. In high level alluvial loams where turmeric is grown, the soil is left in a very friable state after the removal of the crop, and gets sufficiently wet even with a light shower. In such situations the ryot invariably grows a crop of green gram with the first showers of early June, to be ploughed in during August for transplanting paddy.

Ploughing, transplanting and other operations:—Ploughing is rarely done in the puddle. As the soil swells and gets exceedingly soft and miry after flooding this process is necessarily slow. Years ago when the area was limited and each individual holding was smaller than now, puddling was a regular operation. But now the holding has increased in extent and the ryot is obliged to manage on an average ten acres of land within a limited time with a pair of cattle. He therefore ploughs his fields in the dry when the soil is a bit soft after the fall of a shower in the beginning of the monsoon. He then floods his fields straightway, just levels up unevennesses by manual labour and plants his seedlings. This is rather a perfunctory way of tillage from the standpoint of a tamil ryot. But for all practical purpose the method adopted in the Delta answers very well. There does not appear to be any diminution of yield on this account.

Another method is in vogue in certain localities. If the land has cracked well and deep in the hot weather and if irrigation water is available soon after the opening of the canal, before the rains have had any effect of closing the cracks, such lands are at once flooded and transplanting done without any attempt at ploughing. This sort of planting is considered to be the best and is known to give the highest yield. If this ideal condition is vouchsafed for the ryot he is in no need of manuring. Very probably the beneficial effect is bacteriological and is due to the sterilising effect of the extreme heat of the summer.

Subsequent operations after planting consist of only one nominal weeding and attention to irrigation. Just a week before harvest the land is given one good irrigation and the water drained out. Sunhemp is then sown in the moist soil in the standing crop. The

practice of sowing sunhemp for fodder is peculiar to this Delta. It seems to have had its origin in the traditional instinct of the quondam dry land cultivator of the tract to maintain his working cattle in the best condition possible. Being deprived of the sorghum fodder for his cattle on account of the introduction of wet cultivation he has found a suitable substitute in the mixture of paddy straw and sunhemp.

Harvesting:—The harvest begins early in December and continues for about 20 days. The whole Delta practically matures simultaneously, and the harvesting of matured crop is to be delayed in places. To meet this difficulty most of the lands are now cropped with a variety known as “Pinna kusuma” which does not shed its ears so easily. The paddy is not of a superior quality, but as it is mostly exported this point is ignored. The harvest is not immediately followed by threshing. The crop is cut and left in the field for three or four days and then bundled and stacked to be threshed at the ryot's convenience. Usually the ryot takes up his threshing when “Paira gali” or south east wind begins to blow steadily from about the 15th of February. Then alone he is able to dress his grain thoroughly and quickly. At this time of threshing his sunhemp is also ready which he cuts, dries and stacks along with paddy straw.

Before concluding, I wish to touch on a few more points in relation to the subject.

Necessarily with the expansion of irrigation and the inclusion of all the available area under the wet ayacut, a large portion of the Delta has become ill-drained and alkaline. One of the surest means of successfully cultivating such lands is to transplant them very early in the season, and get the crop well established before the heavy rains.

There is a crying need therefore in the Delta to find out a variety of paddy that would grow well when transplanted late and also withstand the ill-effects of submersion. There is another equally important need for a variety suited for alkaline land.

Would it not therefore be a boon to this part of the country if our Agricultural Department evolve suitable strains for the purpose referred to? Is it too much to expect that boon to be within a measurable distance of realization, now that a special paddy breeding station has been recently started in this Central Institute? I hope not.

Certain aspects of cultivation in the Godavari District.*

Leaving aside from our consideration the hill or agency tracts the Godavari District may be broadly divided into :—

- (1) the Deltaic portion and
- (2) the Uplands.

The Deltaic portion is chiefly characterised by the presence of heavy soils formed by the Godavari. In the upland portion, light soils red sandy loam predominate with an appreciable extent of red alluvium formed by the hill streams and a small river that flows in the district—namely the Yelleu.

The Uplands are well drained and the Delta suffers from ill drainage. This district is favoured by an annual rainfall of about 40 inches and the South West monsoon accounts for more than 26 inches. The North East monsoon gives about 12 inches but spends itself in a very few days, while in the other, rainfall is more evenly distributed. The Upland tracts which receive their rain along with other portions are, however, able to sow and raise their chief rainfed crops earlier than the Delta which grows wet paddy mostly. In the North East monsoon season, both tracts raise pulses. In the Uplands, themselves, villages nearer the hills get their rain earlier than other parts.

*Paper by Mr. V. Muthuswami Iyer, Dip. in Agri. for the last Agricultural College day and Conference.

The differences in the texture of the soils and drainage and in the receipt and distribution of rainfall in the two monsoon seasons determine the nature of the crops put in, and their time of planting. For example, gingelly is sown in the Uplands in May and June and in the Delta in January. Ragi is sown in June, July in the Uplands and in November in the Delta. Sugarcane planted after about the 15th of March in the Delta is not profitable while the Uplands planting may be done up to July 1st. In high level wet lands in the Uplands such dry crops as dholl, cotton, gogu, gingelly, thenai, are grown in fields in the midst of other wet fields or contiguous to them, while in the Delta such a practice is considered wasteful and condemned. Parts of the Uplands adjoining the hills which get rain earlier grow cumbu while preference is given to a mixture of gingelly and red gram, sown a little later, in portions further down, and some dry paddies as yeradem and gelama are sown dry in lands under tanks and in the low lying portion of villages on the banks of Godavari.

Land tenure—There are three kinds of tenure: (1) Zamindari (2) Proprietary or Inam (3) Ryotwari. Except in the case of lands held by the Zamindar in his private capacity and of temple and other Inam lands held in trust by him all lands have been, since the passing of the Madras Estate Land Act of 1908, in the occupation of ryots whose interest in the land they cultivate has been secure and who cannot be evicted except under very special circumstances but it cannot be denied that the rent paid to the Zamindar by the occupant is not very high, in very special cases amounting up to about Rs. 35 an acre. If the lands are situated in villages irrigated by the Godavari canals water rate for the first crop is borne by the zamindar and for the second by the occupant. In the case of sugarcane and such other crops as occupy the ground more than one season half is borne by the occupier and the other half by the zamindar.

In the case of Inam lands, occupiers have less interest and it is a refreshing contrast to turn from the Inam lands cultivated by a person to his own lands where he pens his cattle, ploughs and plants in season. In the case of Inam lands rents vary from Rs. 25 to Rs. 60 according as paddy or sugarcane is cultivated.

In the case of ryotwari lands, where the cultivator is the master of his own lands, the crops are generally good and are better cultivated.

Irrigation :—Well irrigation is practically nil in the district. A few wells in the Amalapur taluk which is in the heart of the delta are being utilised for baling water to coconut plantations in summer where the canal is either very low or closed for silt clearance. But low lift appliances as the picottah and what is known as Kareem,—a palmyra split lengthwise and scooped out and attached by a string to a long lever which works it—and baling of swing baskets are common. In upland tracts, in two or three villages we occasionally come across mhotes. The mhote in such cases is not used for raising ordinary garden crops but for fruit gardens.

The Godavari canal system is not unfamiliar at least through reputation and the canals designed are useful both for navigation and irrigation. These canals as they are navigable bring up the produce to important trade centres as Rajahmundry, Cocanada, Nidadavole and Ellore and serve as equalising agencies in the prices and distribution of produce; for example, one bag of 166 lbs of paddy can be sent over a distance of 30 or 40 miles at one anna a bag without largely increasing the congestion of traffic in Railway centres which are already getting stocked over much in harvesting seasons.

In regard to irrigation the Godavari canals flow for over 10 months in the year and are thus practically helpful in raising two crops in suitable situations, in the deltaic part of the district, but

it is not to be presumed that the Delta ryot is perfectly satisfied with the present irrigational facilities. In a part of the district which is benefited by the Yaleru, several villages have, from a common canal to take water for their fields. Here water is taken by turns by each village or group of villages and except when an impetuous and inexperienced man meddles, the work of distribution is very smoothly and very satisfactorily done. There is no unequal distribution and no hitch amongst residents of a village. There are a number of rainfed tanks in the uplands which get their supply mostly in the South West Monsoon. These irrigate the variable extent of wet crops on lands under them and when the monsoon fails is late or insufficient, portions of wetlands thereunder grow cholam or Bengal gram. The deposition of rainfall in the South West Monsoon is such in this District that Cumbu and Ragi which are treated as rainfed crops or broadcast in many other parts of the Presidency, are transplanted here.

In the Delta, owing to the facilities for irrigation and high prices of paddy, the poorer lands also have been gradually brought under cultivation to the detriment of the health of cattle which find gradually diminishing grazing areas and little or no standing or moving room. In consequence, almost all the cattle of the delta are being sent after the transplanting of paddy is over in September to the forest areas in the uplands or to upland villages where private grazing grounds are available. There good grazing is available for about three months in the rainy weather and the rate of mortality is sometimes 10 per cent. With diminished vigour of cattle returning, the loss to the ryot is not negligible; a pair of animals is kept on at Rs. 2/- a month. Latterly it has become an unsatiable desire of rich and influential ryots in the delta to advance varying amounts and mortgage at hypothecation bonds to needy upland ryots who own grazing areas and thus secure grazing for a number of years, keeping their watchman on these lands when the animals are

there. Thus the grazing area available is fairly sufficient though the quality has been deteriorating and the care taken in looking after cattle has been getting less and less.

Wetland:—In the wetlands in the Delta, the chief crops grown are paddy and sugarcane. Paddy is grown in two seasons which are well defined. The first season or the main crop season, extends from June to November and the second crop season extends from middle of January to middle of May. The whole area is planted out in the main crop season while in the second season 20% or less is transplanted. The varieties grown in the second crop season weigh bulk for bulk less than those raised in the main crop season, are inferior in quality and are generally disposed of as wages in kind to working classes and sold for export.

Palagummasari—a main crop season variety—occupies the ground a little more than five months and in point of duration is intermediate between Rasangi which is harvested at the end of October and Konamani which will not be cut until about a month later. It is a heavy yielder and the quality of the rice is good. When this is put in and the black gram or green gram is sown in the standing crop, a few days before harvest, sufficient length of time is secured for the growth of the pulse crop which gives Rs. 20/- to 30/- money return per acre, with facilities for planting second crop paddy in February. Therefore this variety occupies a relatively large tract where second crop is raised or is possible.

Konamani and Atragada which take about six months each to ripen are preferred in places where single crop lands predominate, where water supply is extended for a longer period, though interspersed with periods of dry weather and where transplantation has necessarily to be prolonged over a longer period owing to want of coolies and irrigation of seed beds. The

quality of the rices is good. The area under Konamani is greater than that under Atragada.

In poor classes of wet lands, Akkullu, a pretty long term paddy is grown and this is considered to be the least exhaustive of the paddies known locally. The quality of paddy is good and the variety finds a ready sale. In the wet lands in the standing crops of wet paddy in the main crop season, it is customary in places suited for their growth to grow sun hemp, horse gram, black or green gram, either alone or mixed. These, except sun hemp, are harvested for grain and sun hemp is cut in February and fed to cattle mixed with dry paddy straw. When gingelly is grown in wetlands with the last irrigation a pulse known as Thegapasalu (creeping green gram) is sown about the middle of April or earlier and ploughed in at puddling time. As the second crop paddy is harvested in the middle of May and water has to be drained off about ten days earlier there is not very much scope for sowing a green manure crop in second crop lands. Main crop seed beds are almost always raised dry and second crop seed-beds after puddling. Sowing sprouted seed is almost the rule in the second crop season which is never done for the main crop seed-bed. Seed-beds are very carefully manured with cattle penning or sheep penning or penta if on single crop lands, while on double crop lands seed-beds raised are more a mockery and excite pity.

Sugarcane:—Occupies very well marked tracts in the district and is grown in villages where the soil is better drained. It is planted out in February mostly and cut about 11 months after. Unlike in other parts of the Presidency canes when about four months old are wrapped with their own leaves in the green state and this operation continues for another five months. In the second wrapping bamboos are planted to support a clump of canes and the cane leaves are turned over to keep them in position. The system of wrapping and bamboosing keeps men engaged for a longer period in the district than elsewhere and labour is more regularly distributed and the chief peculiarity connected with cane cultivation here is what is known as profit sharing which is the rule. Land owner plants the canes. Thenceforward share holders do all operations as weeding and

hoeing, wrapping, purchasing bamboos and oilcake manure at their cost and applying and pressing the juice and preparing jaggery; of course, the landowner advances money and realises at harvest time about 12 per cent. interest. The produce is shared half and half, the landlord supplying mill and accessories, cattle, watchman and man feeding the oven while jaggery is being made.

The coolies are thus attached to the land. The landlord finds an easy and safe investment for his capital, without trouble gets about Rs. 150 to 200 an acre and the coolies employment and profits ranging from Rs. 50 to 150 an acre.

Ratooning is not very common. Jaggery is made not into small cubes as in Coimbatore nor in balls as in South Arcot but in slabs about $2\frac{1}{4}$ feet $\times$ $1\frac{1}{4}$ ft. $\times$ 4", weighing about 4 to 5 maunds. Certain tracts produce only one quality of jaggery while the others produce another. In the rainy season these slabs cut into six and bundled in palmyra baskets are arranged in an ill-ventilated room in layers of 2 and 3 and cowdung cakes and rice husk are slowly and gradually burnt on rainy or cloudy days when the smoke arising is considered to envelope and keep off moisture thus preventing the slabs from getting soft.

Notes.

The nourishing qualities and medicinal uses of sugar are so well known for India that the following may be of interest;—

Sugar excites the secretions of the stomach, increases digestion of albuminous matters and of nutritives containing iron and lime, a fact which proves that under proper conditions sugar is a remedy against anaemia, chlorosis and in scrofula. This explains the love of a great many children for sugar in the lump, who afterwards as they grow older avoid plain sugar or sugar by itself, almost entirely. It seems to be a sort of instinct with children

with weak bones and thin blood. * * * The idea that sugar causes bad teeth is an altogether mistaken one. The teeth of the Negroes in the tropics are dazzlingly white and sound. On sugar plantations in Cuba, Louisiana and elsewhere, all Negroes run down with labour or sickness grow sleek, fat and strong again on the return of the sugar harvest solely by chewing the cane. Englishmen and Americans eat more sugar than the French and the Germans and yet they have better teeth than the latter.

* * * *

Sugar seems to act as a digester and that heaviness often felt after a hearty meal is frequently relieved by drinking a glass of sugar water. It is better for lean persons than fat ones.

* * * *

In old times our confectioners, bakers, etc. did not employ sugar in their sweet wares, but honey, whose antiseptic properties were known even in remote antiquity, and the Egyptians, Greeks, etc. frequently used it as an application to serious wounds. For that matter, as late as the seventeenth century, our ancestors used sugar as an application to wounds. The practice, however, fell into neglect and was forgotten until only recently prominent surgeons are again bringing the substance into use. One doctor recommends it in gangrene and has used it with excellent results.

* * * *

Normal and healthy blood always contains sugar, which is derived from all nutritive foods and has absolutely nothing to do with the consumption of pure sugar. That a too great indulgence in sugar, by itself or mixed with other things, can have bad effect and cause sickness is not to be denied, but that its use, either in small quantities or large, can cause diabetes cannot be too strongly denied. Such an idea could be conceived or find defenders only from the fact that the original cause of that only too frequent disease has, up to the present, eluded investigation and remains a

mystery." Louisiana Planter. * * * Vol. LV. No. 3 (K. K. R.).

Common salt as manure:—Presence of common salt in a soil produces a hard impermeable crust and makes the soil moisture not available to plants. In rainy tracts these are but feebly felt. A solution of common salt is, however, a better solvent of mineral matter. Although salt is not generally considered to be a food substance to plants, it is always present in the ash, since it is capable of influencing certain oxidase actions it may also affect the respiration and growth of plants. (Journal of the Board of Agriculture).

Agricultural Department of North Wales recommends the use of salt in place of potash, in view of the fact that it is able to liberate some of the potash locked up in soils. For annual crops such as potatoes a dressing of 5 to 6 cwt. per acre is recommended to be broadcast some weeks before planting. The salt must not be mixed with superphosphate. (Tropical agriculturist).

K. U. K. M.

Sulphate of ammonia from peat:—The production of sulphate of ammonia from peat has now become a commercial success. The process adopted is the "Water gas", hot air and steam playing on an incandescent mass of peat. The red hot peat decomposes the water vapour, a part of the hydrogen of which combines with the Nitrogen of the peat forming ammonia. The gases thus produced are washed and conducted into a chamber where they come in contact with sulphuric acid, sulphate of ammonia being formed. It is said that sulphate of ammonia can be produced for from 4s. 10d. to 5s. 7d. per cwt as compared with 12s. (Australian sugar journal). K. K. R.

We are extremely glad to learn that Mr. B. Dwarakanath, L. Ag. has been gazetted as 2nd assistant to the Chemical Exami-

ner, United Provinces of Agra, Oudh and Central Provinces on Rs. 130 per mensem, in the grade Rs. 130 to Rs. 300. He has already entered on his duties and we wish him every success.

Estate Notes.

We welcome to our midst Mrs. C. A. Barber who arrived on the 8th instant from England after a long lapse of 3½ years. We are glad to see her in excellent health.

Students of Class II were on a short tour of agricultural excursion with the Principal and the Special Assistant in the Trichinopoly District from the 7th to 12th instant.

On the 12th of July last—the closing day of the College Day and Conference—it was announced by Mr. D. Ananada Rao the Vice-President that the Munagala prize medal offered by Mr. K. Ramasastrulu Naidu B. S. was won by Mr. K. Raghavachari L. Ag. for his essay on “Village Economics and How to improve it” adjudged first by the judges and that a prize of Rupees ten would be given by Dr. C. A. Barber to Mr. M. Mangesha Rao Dip: Agri: for his essay on Sugarcane. In the afternoon there was a business meeting and social gathering amongst the Union Members. At night an English drama “Chendrasahsa” and a Tamil drama “Siddhesena” were enacted by the Student Members. The success of the dramas was entirely due to the indefatigable energy and willing help of Messrs. B. V. Nath of the Chemical Section and K. Rajagopala Iyer our popular postmaster. The dramas were appreciated and the best enactors were recipients of prizes at the hands of the audience.

We regret that this portion of the function which brought the Conference to a close was omitted in page 314 of the September issue.

Hockey match. A. C. & R. I. vs. Stanes.—The return match between the above teams was played on the 1st instant on the Stanes grounds, before a fairly large number of spectators. Though we were handicapped in our defence by the absence of Mr. Parnell and Venkatachalam yet our backs and half backs made good their absence by supplying balls to the forwards. The forwards in the wings Sanjiva Rao and Samuel promptly took the balls and put in two goals one each. The game was very much contested and our team won the match by 2 to 1.

Foot-ball match. A. C. & R. I. vs. London Mission High School. There was an interesting foot-ball match played on the 9th evening between the above teams on Mission grounds. The play began a bit late and had to be finished within 45 minutes after commencement. The absence of Venkatachalam, the best defence of our team and that of Dharmalingam a good forward was keenly felt. None the less our forwards pressed very hard and in spite of many shots, the opponents' goal keeper defended very well. The match ended in nil to one.

Cricket match A. C. & R. I. vs. Stanes.—This was played in the A. C. & R. I. cricket field on the 13th instant, with the following result.

A. C. & R. I.				Stanes.			
1.	Vital Rao	...	31	1.	Dawson	...	0
2.	Ramana Rai	...	2	2.	Timmins	...	13
3.	R. C. Wood		17	3.	Dally	...	6
4.	Dr. C. A. Barber		11	4.	Eling	...	0
5.	Sanjiva Rao	...	2	5.	Bern	...	13
6.	Vital Punja	...	0	6.	Hargreave	...	8
7.	Appayyah	...	26	7.	Bean	...	0
8.	Dharmalingam...		0	8.	Bamford	...	2
9.	Swami Rao	...	5	9.	Hamsted	...	7

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10.	Anantarama Iyer	10	10.	Brown	...	4	
11.	B. S. Tolar	...	2	11.	Mcfarlane	...	3

Bowling analysis.

		M.	R.	W.	Balls.
Dharmalingam	...	2	39	8	72
Swami Rao	...	4	19	2	78

Stanes.

Beny	...	1	29	1	54
Dawson	...	0	26	2	56
Bean	...	0	3	0	42
Brown	...	0	94	0	36
Bawford	..	0	22	0	24
Elling	...	0	5	0	12

Departmental Notes.

Appointments etc.—Mr. H. C. Sampson B. Sc. having availed himself of the furlough granted to him, Mr. R. Thomas B. Sc. acts for him as the Deputy Director of Agriculture, Southern Division.

Mr. K. V. Ramakrishna Iyer, 2nd clerk of the Govt. Economic Botanist's Office is appointed as a temporary fieldman in that section.

Notices.

We beg to draw the special attention of our subscribers to the Manager's notice in the advertisement columns regarding the enhancement of the Annual Subscription of the Journal from January 1916 to Rs. 2/ only. This was arrived at at the General

body meeting of the M. A. S. U held in July last, owing to the loss sustained in running the Journal at the very low subscription of Rupee one per annum. We earnestly request our subscribers to continue to subscribe for the Journal.

As the Journal year is coming to a close by the end of next month, the subscribers are requested to remit the subscription of Rs. 2/- for 1916, in advance, to the Manager, before the 31st idem or to accept the January number by V. P. P.

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.

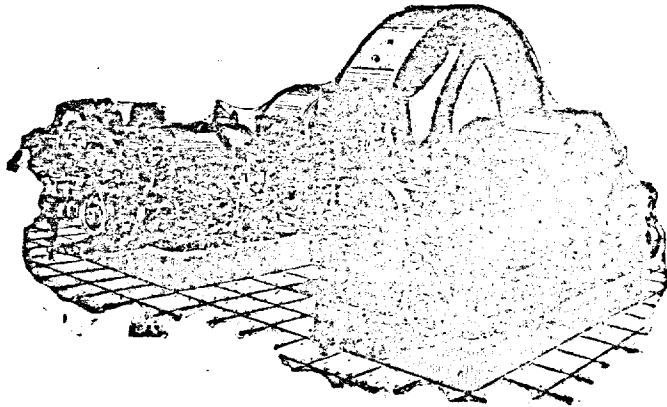
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THE JOURNAL
OF
**The Madras Agricultural Students'
Union.**

Vol. III. December 1915. No. 12.

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

Paddy Breeding Station.

The new Paddy Breeding Station occupies an area of $13\frac{1}{2}$ acres about half a mile to the west of the Farm wet land. The area is a compact block almost entirely surrounded by deep channels. It is hoped that an additional field of $2\frac{1}{2}$ acres will be acquired in the near future and this will give 15 acres of cultivable land entirely self contained with regard to water supply and drainage.

The land is of good even quality throughout and contains no saline or ill-drained patches. The plots over most of the area are very regularly rectangular and of convenient size; thus the land is specially suitable for experimental work. There are two good wells which might

be useful for raising early seedlings or helping out a late crop at the end of the season.

Possession was obtained only just before the season began so there was little time for laying out the station. Visitors must therefore overlook any untidiness of roads, etc., that is noticeable. A small field laboratory and maistry's quarters have already been built and two more quarters are to follow.

The Station is devoted entirely to experimental work connected with the raising of improved strains of paddy by selection and cross breeding.

This year's crop consists mainly of material for studying the method of inheritance of all the various characters wherein the numberless varieties of paddy differ from each other. Some of these characters are of direct economic importance; e. g., duration, habit of plant, size and shape of grain, colour of rice etc. Other varietal characters, such as the colour of various parts of the plant, awning, size of outer sterile glumes, etc., are of considerable scientific interest and incidentally of economic interest in that a knowledge of their behaviour facilitates breeding work. In addition to definite varietal characters there are others in which plants of the same variety often differ from each other. Of these, 'tillering power' may be noted as a character of great economic importance.

Though the Station is some distance from the College and the road is generally abominably muddy, any one paying a visit would be amply repaid by the amount of interesting material to be seen.

A collection of about one hundred different varieties, growing side by side, illustrates the great variation of which the paddy plant is capable. It also furnishes striking evidence of what has been done during past centuries by the Indian ryot who is responsible, in all probability, for the establishment of these varieties by means of selection. It is easy to see how vast are the possibilities of building up new strains, specially adapted to different uses or circumstances, when such a wealth of material exists.

The most interesting lots however are those derived from parents which were impure for one or more characters last year. These lots are now splitting and giving Mendelian ratios for the different characters. Some lots, where only one or two simple factors are concerned, are quite simple and easily understood. Others are so complex that it would be hopeless to try to make out anything from them had not the genius of Mendel pointed out the prime necessity of studying one character at a time. By so doing it is now possible to reduce to a definite order, easily understood, lots which at first sight appear hopelessly confused and complicated.

From the crops of last year and this, it has been possible to work out the method of inheritance of a very large number of characters. Information of great scientific interest has been obtained especially with regard to complex cases where there is interaction and interference between separate characters. There are still a number of characters which are not yet understood and

still more which have not been studied. The whole time of ten persons is spent on the work but even so there is much that has to be passed over for want of time.

Unfortunately most of the characters of direct economic importance are of a complicated nature. They will be thoroughly understood only after much study, but there is every prospect that the final result will much more than repay all the trouble taken.

F. R. PARNELL,
Govt. Economic Botanist.

Nendrum Plantains (*Musa sapientum*).

The cultivation of Nendram is confined to the West Coast viz., Malabar, Cochin and Travancore. It is otherwise known as 'Eathan Kaya' (Picotta plantain) indicative of its large requirements of water, since picotta is the oldest known water lift here. On account of the attention that one has to bestow on the crop the area which each ryot puts under it is confined to a few cents for which again picotta is a convenient water lift. When the owner of the plantation is the labourer as well, it is for him a necessity to set up a picotta as the most preferable water lift for irrigation. Therefore the cultivation of Nendram Plantains, over a large area of the West coast, is closely associated with the picotta or Eatham: hence the name. 'Ona—vazha' a name by which it is known over a large portion of North Malabar explains the idea that it takes a prominent place for the Onam feast of the Malabar people. It is considered a necessary fruit of consumption during the Onam days and can be found in each and every house of a Malayalee whether poor or rich. Almost every ryot in the southern taluks plants at least a few plants for his home consumption, if not with a view to sell the surplus at a good profit at the Onam Fairs where sometimes fancy prices are offered for properly matured fruits of big size. In many lease deeds in certain parts

of Malabar one or two nendrum bunches worth 8 to 10 annas can be seen laid down as a bounty the tenant has to give his landlord at the Onam time; a failure to submit them is considered to be an insult. However, the fact remains that the price of the bunches, as stipulated in the document, has to be paid to the landlord with interest if delayed. Even in the remote corners of Malabar the large and busy sales of nendrum fruits in weekly fairs coming close to Onam is, indeed, a sight to see. During some years the crop happens to be late and the Onam market price of nendrum runs high in as much as the demand increases since the requirements cannot be curtailed. So much for the importance of nendrum in localities where it is largely cultivated.

There are two varieties, one known as 'Nendrum' (nana nendrum) or 'Ethan Kaya' or 'Ona Vazha' smaller bunches with sweeter fruits. The other is known as 'Attu Nendrum' which produces bigger bunches with thinner yet cylindrical fruits which when ripe are not as sweet as the first variety. Attu Nendrum can be allowed to remain in the ground for two years allowing the best of the first formed suckers to bear a bunch, and does not require as much water as the other. However, when cultivated in paddy lands, as it is mostly done, it is not retained longer than one season. In the northernmost parts of Malabar where nendrum cultivation is not very extensive the second variety is grown, and the method of cultivation adopted differs very widely in details from the one hereunder described. This is, however, the more popular method adopted over a larger area where the ryots always grow the sweeter variety.

Single crop wet lands, often seen in terraces, and fertile garden lands are selected for this cultivation. Double crop lands are seldom selected but not wholly avoided. The questions for the ryot are the availability of plenty of irrigation water and the possibility of draining the crop during the rainy months.

In about October trenches 10" to 12" broad and 12 to 18 inches deep are dug about six and eight feet apart alternately. These are allowed to weather for a month or so at the close of which any available rubbish is put in and set fire to and the ashes dug in with the

partially burnt soil, when the trenches are ready for receiving the suckers.

Well developed suckers removed from the previous crop are selected for planting. The roots (underground stem) of the suckers are stripped of their fibrous roots, and dusted with ashes while they are green, and often dried till the bits of false stem on the roots are dried up. These suckers are then planted out about 6 feet apart in trenches with the roots fully buried. A handful or two of ashes are often worked into the whole for each sucker and pot watering is given until they sprout. Some ryots plant a few vegetables, say cucumber, chillies etc., on the newly heaped narrower ridge while the broader ones have to accomodate the irrigation channel for the main crop. When plants are well spreuted pot watering is stopped, and the irrigation by means of the old picotta or any other water lift is resorted to. After the plantains grow to a height of 3 feet heaps of cattle dung and bundles of jungle leaves, such as *calycopteris floribunda*, mango, ficus leaves and even lantana, are applied to the roots of these plants with intervening layers of soil taken off the sides of the ridges. The application of manure and earthing up being repeated every fortnight or a month, the field is gradually levelled. The whole area is then dug once and kept as fine as possible; each plantain can be said to receive about 2 Madras Measures of ashes 25 lbs. cattle-manure and 30 lbs. of green leaves. Some ryots prefer to apply a mixture of $\frac{3}{4}$ cattle-manure and $\frac{1}{4}$ goats-dung. Cattle-manure applied is mostly dry, ashes if any available are also put in. Fish manure is slowly gaining in popularity as a manure for plantains along the seacoast where it can be had cheap.

Circular pits 4 to 5 feet in diameter and 5 inches deep are made round each plant to hold irrigation water given every other day. Ashes are often mixed with water in the beds while being irrigated. The development and taste of the fruits are believed to depend on the regularity of the irrigation given during the months of March and April, when the bunches are just forming within the false stem. Suckers, if any, coming up before the fruits attain their normal size, are pressed under foot. Each plant when about to bear a bunch

is given a strong support planted deep into the soil. Such props last with the ryot for a number of seasons. The bunch-forming-time is the most anxious time for the ryot, because the south west monsoon winds are then very strong and the tender succulent plantain bunches may be easily blown down by a sudden gush of wind. Wind breaks are sometimes provided although the ryot would himself speak of them as screens to shut against the evil eye; for which again hoisting ridiculous forms is as common as elsewhere. The ryot has also to attend carefully to avoid the new bunch resting on some of the leaf petioles from which it may slip down and break. All trouble will be in vain if these minor, yet most important details are not carefully attended to.

When rains set in in June the ryot finds that his crop does not require any more irrigation, and earths up the plants often making a mound round the bottom of them with intervening deep drains to get rid of any stagnating water. If water stagnates at this stage the plants turn pale and gradually yellow with leaves often falling down and roots (underground stem) rotting in worst cases. Too large a quantity of manure applied by an over anxious ryot often causes the terminal shoot to rot and the plant is lost. Throughout the period, from the fruits assuming their normal size to the harvest time the ryot has to employ a watchman night and day, the former for fear of hungry thieves that try to knock off fruits to be boiled and eaten because during the months of July and August there is a pronounced scarcity of food grains and work in these parts. When fruits are well maturing green birds, squirrels and at night flying foxes and bats do considerable amount of damage, reducing the market value of the bunch. Well matured fully developed sound fruits providing a good appearance to the bunch fetch the highest price. Sometimes too much manuring or exposure to strong weather causes the fruits to crack. Presence of one or two cracks in a bunch reduces the price considerably out of proportion to the good fruits the bunch contains. To prevent cracking and attacks of enemies the bunches are often wrapped in dry plantain leaves.

It may be interesting to note the special rates of rent fixed for growing the crop in certain parts. Two fruits or sometimes one for

the land and another fruit for the use of the well for irrigation water is the usual rate. A careful cultivator not infrequently does the work of guiding water himself. Much of the irrigation work has to be gone through during the busy dry ploughing season and the work is often finished at nights. Therefore contract rates are more prevalent. The charges may be one to two annas a plant. Coming to the cost of cultivation as a whole, it varies considerably according as the jungle leaves and cow dung are cheap or dear and the quantity of each used. Nearness to irrigation water is another consideration. However, to put it at Rs. 200 to 300 per acre will be about the mark. No ryot keeps an account of it nor is the individual holding generally more than a quarter of an acre. The figures therefore are more or less approximate.

Many cultivators, each with his small area, join together and raise the market crop of a village in a few acres all in one block, where most of the watching work can be conveniently done by the cultivators themselves in turns. A tope when grown for the market is sold to the dealer as a whole, fixing an average value of six to eight annas per bunch. The price of a good bunch may go up to a rupee and a quarter. Retail sales are effected at rates varying from Rs. 5 to Rs. 30 per 1000 fruits according to its appearance and quality. Each bunch of this variety contains nearly 60 fruits. Putting down 1000 to 1100 plants to the acre and allowing 5% for possible loss a ryot can, in the ordinary course of events, obtain a gross income of Rs. 400 to 750 per acre. Sometimes when plants are put in closer the total number may be greater and the value for a bunch will be less. The ryot can also realise something out of the sale of suckers. From each plant one good sucker can be expected. This may be worth nearly 8 pies, but the demand is not always sure. Therefore about Rs. 25 per acre out of the sale of suckers may be taken as a possible figure. Vegetables grown are not intended for sale and their value may be put down as Rs. 5 per acre. The inner stem and tender underground stem are also largely used as vegetables, sales of which cannot be effected. The leaves of the suckers when bunches get matured are another asset of the cultivator, but are seldom sold.

The cultivation is mostly in the hands of needy ryots. It is a great pity that they are often unable to enjoy the full gain from the crop because of the redoubtable money lender ensnaring him with an enticing bait of a few rupees of advance when he is in great straits for money. The usurer is a trader as well. When the crop comes to maturity he offers his unusually low prices for the produce and the poor indebted cultivator has to yield to his formidable friend a good deal. If the idea of co-operation as practised in irrigating the crop and watching is extended to meeting the cultivation expenses and perhaps some of the bare necessities of life during the cultivation season, the cultivator can be free. This end can be gained by establishing a co-operative credit society in such a locality where it is badly wanted.

As regards trade in fruits, apart from Onam fairs, and the use of green and ripe fruits there is a good deal to be written. The most important is the large supply of green and ripe fruits to towns like Calicut, Palghat and even Madras. As a vegetable green fruits are priced high in the West Coast. Green fruits, when the rind is peeled off, are sliced into thin circles salted, fried in coconut oil and sold in Calicut bazaar. The sale is large enough to attract the notice of any casual pedestrian on the bazaar road at Calicut. Of late, this trade is increasing and becoming prominent in most of the West Coast towns. Green fruits sliced fried without salt, and seasoned in boiling jaggery mixed with spices form a highly delicious dish (Sarkara-upperi) in Malabar. Raw fruits sliced and dried are powdered into a sort of flour, which when boiled is considered to be a very nourishing food to young children. Ripe fruits are boiled and mashed with water to a consistency thicker than jam and preserved with ghee, honey and sugar for a long time. There is a very great opening for a big business in the preparation of the various jams and jellies and perhaps in the flour as well. The leaf-sheaths are very fine, and a valuable fibre is extracted out of them in Travancore, where a beginning in this industrial aspect of plantain cultivation is being made with a certain amount of success.

K. UNNIKRISHNA MENON.

The Choice of Lubricants for Machinery.

The advancement of scientific knowledge has been gradually causing the agricultural and industrial classes, who were some years ago putting in 14 to 16 hours work a day, to go in for machinery and implements which are more efficient and less expensive taking into consideration the cost of manual and animal labour of the present day.

Now we see even in small villages far from railway stations agricultural and industrial works being carried out by the use of machinery and improved implements particularly suited for the works, such as engines, pumps, rice mills, ginning machines etc. It is needless to mention that the machinery and improved implements are gradually replacing, except in certain circumstances where manual and animal labour is necessary, the less efficient and more costly manual and cattle labour and old inefficient implements.

Having installed machinery for Agricultural & Industrial purposes it is necessary for the owner to see that the plant is worked with as much efficiency as possible. That is to say one should be careful enough not to allow the depreciation on the use of the machinery to run very high and to get as large a proportion of work as possible compared with the amount of money expended in running the machinery.

The depreciation of the plant can be brought to a minimum and the efficiency to a maximum in working a plant provided that the frictional resistance to motion of the machinery be brought to a minimum. This is not all. As I have chosen to deal with the choice of lubricants I confine myself to deal so far as the relationship between a proper lubricant and the successful working of a plant is concerned.

When any machinery is run, the surface of the parts that are set in motion rub against each other resulting in resistance which is called "friction." To achieve the above objects, it is desirable, that this frictional resistance should be brought to a minimum. And this can be done by lubricating the surfaces that rub against each other with suitable lubricants.

In some villages the owner of a machinery lubricates the bearings of his machines, and sometimes even the cylinder of an oil engine, with castor oil or coconut oil or a mixture of castor and some mineral oil thinking that these oils will satisfactorily serve his purpose so well as mineral oils specially manufactured for particular use and imported from foreign countries. As a result, in a short period his machinery gets out of order and he offers it for sale, but none would buy them though the price he demands is far less than what he originally paid for it. And he never understands the cause nor does he wish to learn the cause from people who could advise him; on the other hand he forms an opinion that investing capital in machinery is a waste.

Any vegetable oil or animal fat contains a fatty acid and glycerine. This fatty acid acts on the metallic surfaces of the machine forming a metallic salt or soap and corrodes the bearing surfaces; glycerine is practically of no value as a lubricant. A vegetable oil kept in a brass or copper vessel for a few days will result in the formation of a blue soapy substance on the surface with which the oil was in contact, showing thereby the action of the acid present in the vegetable oil on the metal. I have seen a power transmitting shaft the bearings of which were lubricated with coconut oil for a period of 5 years. The shaft was corroded at the bearing area to an extent that it was too weak to be used for the purpose. Besides, during the time the shaft was in use it was absorbing more power, in overcoming the frictional resistance owing to the corroded rough bearing surfaces and the formation of a metallic salt which offers high frictional resistance, than another shaft transmitting the same pressure and power lubricated with suitable mineral oil. And further a vegetable oil does not satisfy the conditions required for a lubricant for machinery.

A good lubricant should have a good percentage of hydrocarbons, the required viscosity (i.e.,) degree of fluidity, flash point (i.e.,) the temperature at which the oil begins to flash and decomposing temperature i.e., the temperature at which the elementary particles

combined by affinity or chemical attraction separate from each other and should not contain any acid matter.

When a bearing is lubricated the lubricant should be viscous enough to remain between the rubbing surface in the form of a film so that when the machine is run the particles of oil slide one over the other keeping the metallic surfaces apart from rubbing against each other, without being squeezed out of the bearing by the pressure which the surfaces are subjected to. For high speed and low pressure such as the oil-engine piston, the yarn spindles in a spinning factory, the centrifugal cream separator or a bicycle a thin oil should be used. For high pressure and low speed such as the fly wheel shaft of an oil engine or main shaft bearing, the oil should be thick.

If a thick oil be used for low pressure and high speed the friction between the particles of the oil itself will offer sufficient resistance even to stop the machine. A heavy steam engine cylinder oil, used in the cylinder of an oil engine will stop the engine in a few minutes. The lubricants manufacturing firms, taking into consideration the good points already referred to above, manufacture lubricants of various kinds possessing various degrees of these qualities so as to suit the various pressures, speeds and temperatures. For instance in an ice machine the lubricant should be a non-freezing one. Vegetable oil freed from acid matter may be used if it satisfies the above conditions (for instance almond oil freed from acid matter is used for watches and clocks as a lubricant). In general, vegetable oil has a low flash point (open or close) and a low decomposing temperature freezes at lower temperatures than mineral oils. In mills situated in hot climates people are very careful not to use vegetable oil at all. For cotton waste soaked in a vegetable oil and exposed to the open atmosphere will decompose and even catch fire.

In the Central Farm Coimbatore engines, pumps, (centrifugal and triple acting reciprocating force pumps) cotton ginning, thrashing, cotton seed crushing, chaff cutting, refrigerator and bone disintegrator machines are at work every day. Only one kind of oil has been used both for cylinder and shaft bearings in the following manner and

have been found to be quite satisfactory for practical purposes. The fresh oil is used first for cylinders of engines and the waste oil from this is carefully filtered and used for shaft bearings. Hornsby special cylinder oil from Messrs. Massey & Co., was being used for sometime, later Valvoline oil from Messrs. Vacuum Oil Co., was used and now light engine oil from Messrs. Best & Co., is being used. The cost of these oils vary, from one another, a little and in quality no perceptible difference is noticed in the use of these oils.

In conclusion I may state that, even though a mineral oil may be more costly, vegetable oil is not at all desirable to be used as a lubricant if it is not freed from acid matter and does not satisfy the other conditions. A mineral oil possessing the required viscosity, flash point and high decomposing temperature can be obtained from oil firms and will be very satisfactory as such oil does not contain glycerine and contains hydrocarbons, which do not react with formaldehyde and sulphuric acid, which are essential for lubricating purposes, as such oils have a low sp. gr. and high viscosity.

A. K. SUBRAMANIA AIYER.

Paddy in the Musiri Taluk of the Trichy. District.

As one passes through the Kadarambam areas of the Musiri Taluk in the paddy season, one is struck with the excellent crops of paddy being grown there. The reason is that intensive cultivation is responsible for this. Paddy season extends from Ani to Margali (15th June to 15th December). Seasonal planting is considered absolutely necessary to achieve best results. The lands are generally under tank irrigation supplemented by wells. The latter are so very useful that Cumbu and Ragi are raised solely with their water as a first crop. Broadcasted crops are said to yield better than transplanted ones. The seed rate for broadcast paddy varies from 12 M. M. to 16 M. M. and that for transplanted paddy from 24 M. M. to 32 M. M. About 7 cartloads of leaves obtained from neighbouring forests are applied. A yield of about 5000 lbs. per acre is obtained. Improvements done in this

tract by the Agricultural Department are (1) the growing of green manure crops and (2) economic transplanting of paddy.

Under the first Dhaincha has been introduced. The ordinary practice in former years was to obtain leaves from forests and to supplement them by green leaves cut from the trees planted for the purpose. *Portia* and *Poinciana elata* are the common ones. Dhaincha is grown mixed with cumbu. Mixing it with ragi has been noticed in a few cases. The introduction of this crop has brought about results very advantageous to the ryot. The disadvantage is obvious as Dhaincha quickly smothers cumbu and reduces the yield. The growth has been 8' to 15'. The sowing of Dhaincha at hoeing time of cumbu is much deprecated by some ryots as it does not grow well later on and in several cases germination too, is considered unsatisfactory. The ryots are not willing to forego a portion of cumbu in favour of Dhaincha to grow it as a pure crop. In such cases the only way is to grow it mixed with cumbu and to try to put the growth of Dhaincha down as far as possible till cumbu is harvested by cutting the tops. In some cases, where this was done, the ryots were disappointed. This season was peculiarly favourable for its growth, by the frequent showers after sowing. When the plants were topped, side shoots which grew rapidly smothered the cumbu. Thus topping had not had its desired effect. Even with this disadvantage, the ryots have had some advantages this year as explained below.

The carting of leaves from forests after rains is the usual practice. The cultivation of paddy will last for 3 months and more after water is received in the tank or river as the leaves can only be slowly carted during the rainy season and with much difficulty as the way becomes very miry.

The value of permit per cartload of leaves has increased from one Rupee last year to Rs. 2/- this year. In addition the ryot has to pay about annas four per cartload to the middlemen who obtain for him the leaves. 20 bundles are carted and for collection of leaves it costs as much as 3 to 4 Rs. per cartload and the carthire from the

forest to his lands is Rs. 2 to 3 according to the distance, so that the total cost is about 8 Rs. per cartload. The ryot applies 7 cartloads per acre, the value of leaves being Rs. 50/- roughly.

By growing a mixed crop of cumbu and Dhaincha the ryot loses Rs. 30/- an acre on account of the less yield of cumbu and straw and the expense incurred in cutting down the Dhaincha than by growing a pure crop of cumbu. But, the Dhaincha crop gives sufficient quantity of leaves for the area on which it is grown. The value of the green leaves may be taken as Rs. 50/-, thus giving a gain of Rs. 20/- We hardly find a ryot going to the forest this year to collect the green leaf manure. The prohibition of cutting certain kinds of leaves from forests by the authorities, considered by the ryots to be of particular value for paddy is not felt. Besides, the yield is in no way diminished by the application of Dhaincha leaves while the ryots spend only a few annas towards the cost of the seed.

The following difficulties were brought to notice :—

Yield of cumbu is diminished. The cutting of Dhaincha crop is a difficult matter and involves much labour. The tips of pods injure the legs if the application is done after ripening of pods. Several ryots inform me that the effect of the crop on paddy after it is fully ripe is not so good and marked as when it is applied fresh and in full flower.

The advantages of sowing the Dhaincha crop pure are many :—

The germination would be closer, the plants would be thinner and more easily pulled up thus avoiding heavy harvesting charges incurred by sowing mixed with cumbu. The maturing of seed is also delayed, the plants being closer. If cumbu is sown pure in half the area it would bring in a greater yield. Thus, the growing of Dhaincha as a pure crop is recommended.

W. RAGHAVACHARI.

Notes.

Mr. Maxwell Lefroy has been appointed Imperial Silk Specialist.

We are extremely glad to note that Mr. D. Balakrishnamurthi Dip. Agri., one of resources and first grade Farm Manager, has been gazetted to act as Assistant Director of Agriculture, North Division. We wish him every success and confirmation in the appointment.

Molasses Road Making:—In Denmark, they have been trying out a Scheme of laying the dust by means of Molasses. By means of a mixture of water and Molasses—90 to 95% water and the rest Molasses—a fine road was made and made cheap. (Louisiana Planter). K. K. R.

Owing to the scarcity of potash occasioned by the war the value of seaweed as a potash manure may not be overlooked. All the kinds of seaweed useful as manure, grow attached to rocks or stones and are therefore absent from the sandy or muddy parts of the coast. They can, however, be induced to grow in such places by the provision of suitable stones to which the plants may anchor themselves. There are several places round the coast of Ireland where seaweed is cultivated in this way and suitable localities probably exist elsewhere where this practice might be extended with advantage.

Large stones are collected from the shore, taken out in boats at high tide, thrown overboard and subsequently, at low water arranged more or less regularly on the muddy or sandy bottom. The stones, of course, are covered by the sea at each incoming tide and

they soon become coated with a growth of "Seedling" seaweed plants. (Journal of the Board of Agriculture). K. U. K. M.

Cane sugar v. s. Beet sugar:—"From sugar that is beet, I advise you to abstain. It is rightly so called being beat by the cane. But if you want sugar deliciously sweet, remember cane sugar can never be beat." (Louisiana planter). K. K. R.

At the instance of the Agricultural Department, a practice of growing Sunnhemp as a green manure crop for sugarcane has been established in the village of Agrahara Samakolam in Coimbatore Taluq, Coimbatore District during the past two years. The ryots now grow Sunnhemp, after the harvest of Ragi, in September without any irrigation, for about two months when the crop is removed and applied to the fields on which it is grown. The land is then flooded with water until the Sunnhemp green manure crop decomposes. The land becomes fit for ploughing in the dry in about 20 to 25 days. The field is ploughed a number of times during the subsequent months and an application of cattlemanure completes the preliminary preparation of the land for sugarcane planting in February. The lands being rich the Sunnhemp crop grows exceedingly well to a height of about 8' in a couple of months. The practice is extending year by year. The area of this green manure crop in 1914—15 was about 30 acres while during the current year is over 50 acres. Thus the value of leaves as a manure for sugarcane is well understood. It is hoped that this practice which is an exceedingly good one will be adopted with great advantage by those who have not tried it yet in the District. W. R.

"The news wired by a New York correspondent a day or two ago that a planter has grown cotton ranging from white to deep olive green and that experiments are continued with a view to

growing black cotton is regarded in Bombay as more than of passing interest. If it is pointed out by millowners experiment that growing black cotton is successful, it will have far reaching consequence as natural black cotton will replace black-dyed cotton. There is always a large demand for black-dyed cotton for manufacture of cloth and this black-dye is made in Germany who used to supply it to the world. If black cotton is successfully grown to any large extent it will produce a revolution in the economic aspect of the industry and make the world independent of German dye. Black cotton is not only used for working black cloth but for working strips and other patterns in a great variety of cloths." (Madras Times.) K. U. K. M.

We extract the following interesting information from the monthly report of the Deputy Director of Agriculture Northern Division, for October 1915.

"I visited Velangi (Godavari District) because I had heard that the whole village had transplanted their paddy crop according to our method but entirely of their own accord and was under the impression that one ryot had started a few years ago and that the others had followed. It was perfectly correct that the crops were all singly transplanted but on making enquiries as to when the practice had been started we were informed that it was about 60 years ago, long before the opening of the canal. The ryots informed us that their fathers had discovered that on the higher fields to which water had to be lifted, the crop was always better if the seedbed was sown thinly and the seedlings were good and that they adopted the practice throughout for both high and low lying fields. I see no reason to disbelieve their statement. It is another instance of the curious lack of interest in or absolute indifference to the methods adopted in another village, shown by the ryots of neighbouring villages."

The Assistant Director of Agriculture Central Division, writes as follows in his monthly report for October 1915.

"Another fact which attracted my attention this time was the method of using Varagu and other straw in paddy nurseries and in fields where sprouted paddy has been sown broadcast under puddle as a mulch. This system apparently checks the rise of salts in alkaline situations and hence used to a large extent. The very same day or the next day after the seeds are sown, the straw is spread on the surface of the land and this is repeated even after the crop sprouts up and it is not uncommon to note that within a month this process of mulching is done three times."

Feeding Experiments:—In feeding experiments with ten dairy cows, in which hay and wheat bran constituted the basal ration, and gluten feed and coconut meal the supplementary feeds, substantially the same results in milk yield and slightly more butterfat were obtained from the coconut meal than with the gluten feed ration. In amounts of 3 lbs to 4 lbs daily per head, coconut meal is considered to be a desirable dairy feed in Massachussets. (Experimental Station Record.) K. K. R.

The poisonous nature of castor oil seeds:—There is only one species of Ricinus plant known to Botany viz., Ricinus communis, but there are a number of varieties. All the varieties tested have proved poisonous, no matter what the size or colour of the seeds. The poison is contained in the shelled seeds and not in the shell, capsude, or oil extracted from the kernel. The substance containing the poison is known as ricin; it is not visible as such in the oil-free kernel; in quantity it forms only 1 per cent. of the dry, oil-extracted kernels. As, however, ricin exceeds strychnine or arsenic in intensity, small quantities only of ricinus seeds suffice to make a feeding stuff poisonous, a single gramme of the kernel

mixed with several litres of milk having proved sufficient to poison a calf. (Agricultural news). K. K. R.

We regret to record the untimely death of Mr. G. Kamakshi Row Nimbalkar, one of the members of our Union. He passed out of the Saidapet College about 18 years ago and owning much landed property in Uttamapalayam and Madura, settled as a private farmer for a number of years in the Madura District until, owing apparently to family considerations, he moved to Madras a few years ago and kept a Chemist and Druggist shop at Triplicane. When Periyar project brought water to the dry lands of Madura and Melur Taluqs, rich and poor people rushed in to purchase lands at all costs. He then wrote largely to the English and Tamil newspapers in Madras and Madura about the methods of cultivation which could be safely and profitably followed in the new tract, besides giving personal agricultural advice to several. For a time he managed some of the private lands of the Zemindar of Vadagari (Hon'ble Dewan Bahadur V. Ramabhadra Naidu). He had come to the College Day in 1913 and wrote a highly commended essay on Paddy cultivation for the Munagala Prize in 1914. We extend our heartfelt condolence to his wife and children and to his father-in-law, Dr. M. C. Nanjunda Row of Mylapore.

M. R. R.

The Botanical Series Memoirs Vol. VII, No. 3 "On the inheritance of some characters in wheat" contains the following interesting information.

The crosses between Pusa 22 wheat, a fully bearded one and A 88, a good analyser, being absolutely beardless showed that two factors are involved in the development of beards (long awns) in Pusa 22 wheat. By a complete study of the third and subsequent generation plants, the two constituents of the fully bearded character of Pusa 22 wheat were isolated into long and short

tipped ones, and Mrs. and Mr. Howard were able to recombine the constituents, long tips and short tips, and produce the fully bearded character of Pusa 22. Similarly by combining Pusa 6, which appeared to carry the long tipped factor and Pusa 7 the short tipped factor, the fully bearded character of Pusa 22 was produced. Such isolation and recombination of factors are extremely interesting from a scientific point, and the authors are of opinion that there is economic significance as well by such studies. K. C. J.

"Agriculture is at once an art, a science and a business; the researches of naturalists, chemists, geologists and mechanicians are daily contributing to the elucidation of its principles and the guidance of its practice; while its pursuits afford scope for the acutest minds they are relished by the most cultivated. As a business it shares to the full in the effects of that vehement competition which is experienced in every other branch of industry and has besides many risks peculiar to itself. The easy routine of the olden time is gone for ever; and without a good measure of tact, energy, industry no man can now obtain a livelihood by farming. It is desirable that all this should be known, as nothing has been more common than for parents who have sons too dull to be scholars or too indolent for trade to put them to farming; or for persons who have earned a competency in some other calling to covet the (supposed) easy life of a farmer and find it to their sorrow a harassing and ill requited one."

(Encyclopedia Britannica).

We would draw the attention of our readers to leaflet No. 5 of 1915 of the Department of Agriculture, Madras, by the Director. It has a short interesting note on and a fine coloured illustration of 'Water Hyacinth' (*Eichhornia speciosa*, Kunth) a pestilential weed of Tropical America. The plant is said to be seen now in various parts of this Presidency? It can be easily recognised by its pretty mauve flowers and green thick fleshy leaves with bladder like swollen

stalks. It grows rapidly in wells, ponds, rivers, channels and in fact in any stationary or slow moving fresh water. Its dense vegetation seriously impedes the flow of water and even blocks up small ponds. In parts of America it has spread so badly as to obstruct navigation in some of the rivers and to necessitate an expenditure of several thousands of pounds to eradicate it. It is beginning to give trouble in Burma as in Australia and is just appearing in Bengal. It occurs in Madras near the Adyar, between Chingleput and Conjeveram and in the irrigation channels in the neighbourhood of Chidambaram and Mayaveram and in many places in the Malabar District. If it is allowed to grow unchecked it is feared it may grievously affect our water and irrigation supply. Its dense vegetation in Chingleput has been found to make an ideal breeding place for mosquitoes. Under these circumstances this leaflet of our Director appears as a timely note of warning requesting all gentlemen to assist in eradicating this weed which can be done by uprooting it and burning in the early stages of growth.

Estate Notes.

Mr. W. H. Harrison's research work at Coimbatore on the chemical and bacteriological changes taking place in paddy soils has been accepted by the University of Manchester as of sufficient merit to enable that University to confer on him the degree of D. Sc. We heartily congratulate Dr. Harrison on his well merited distinction.

Mr. S. E. B. Stevenson, C. I. E., retired Deputy Inspector General of Police from Salem and the Hon'ble Mr. E. F. Barber Hon. Visitor from Ootacamund, visited the College and the Farm early last month and this month, respectively.

Students of all the three classes of the College were examined by the Deputy Directors of Agriculture, Northern and Southern Divisions, in practical Agriculture, from the 6th to 11th instant.

Old students of the College will probably miss the Mahagony trees which once occupied the Lawley Road. Although great pains were taken to start them, they had never done well and it was decided to remove them sometime ago. Since then some of them seemed to have made special efforts to pull themselves up, but alas, there was none to intercede on their behalf to spare them yet another year. The axe has now been laid at their roots, but there is no doubt that their removal has improved the Lawley Road considerably, the ill kept cactus has gone, the road is appreciably widened and the rain trees are showing themselves to advantage.

Of the many activities of the Farm Poultry keeping is of the most recent. Grading of country hens with Leghorns is being done systematically and there is quite a large brood of them. The Leghorns are pre-eminently suited for egg-laying. Ducks and Turkeys have been added. They will play ducks and drakes with the grain in the threshing floor, specially during the paddy harvest.

Departmental Notes.

In G. O. No. 2556 dated 30th November 1915, the Government having sanctioned another Assistant Director of Agriculture the following will be the Agricultural charges in the Presidency.

Assistant Director of Agriculture Northern Division:—

With headquarters at *Anakapalle* in charge of Ganjam Vizagapatam and Godavari Districts including the 2 Farms Anakapalle and Samalkota and the Supervision of Parlakimidi.

Deputy Director of Agriculture, Northern Division:—

With headquarters at *Bellary* in direct charge of Kistna, Guntur, Kurnool, Bellary, Anantapur, Cuddapah and Nellore Districts including the three Farms Hagari, Nandyal and Sirvel.

Assistant Director of Agriculture, Central Division:—

With headquarters at *St. Thomas Mount* in direct charge of Chingleput, South Arcot, North Arcot and Chittoor Districts including the Farm Palur.

Deputy Director of Agriculture, Southern Division:—

With headquarters at *Trichinopoly* will be in special charge of Tanjore, Madura, Ramnad and Tinnevely Districts including the Agricultural Stations of Manganallur and Koilpatti.

Assistant Director of Agriculture, Southern Division:—

With headquarters at *Trichinopoly* will be in charge of Trichinopoly, Salem, Coimbatore, Malabar and South Canara including the Taliparamba Agricultural Station.

Appointments etc.,—Mr. D. Balakrishna Murthi Dip. Agri. Farm Manager First grade, has been appointed to act as Assistant Director of Agriculture N. Division.

Mr. K. Ramasastrulu Naidu B. S. Assistant Director of Agriculture, N. Division, is transferred as Assistant Director of Agriculture, S. Division.

Mr. K. Narayana Iyengar Dip. Agri. to take charge of Anakapalle Agricultural Station.

Mr. T. V. Rajagopalachari Dip. Agri. to take charge of Hagari Agricultural Station.

Mr. V. S. Ramaswami Aiyar, Dip. Agri. to take charge of Sirvel.

APPENDIX A.**Report of the working of the Madras Agricultural Students' Union for the year 1914-15.**

The working committee begs to submit the following report on the working of the Union during the year 1914-1915.

Before the formal submission of the report, we, in common with the other citizens of the Empire, feel but too deeply that we are this day met under a great shadow, the shadow of the great war in which thousands of brave British and Indian soldiers along with those of the allies are sacrificing themselves to keep down the arrogant militarism of a misguided nation. This shadow did not exist last year and let us pray that the enemy will have been vanquished and that the calamities and miseries consequent on this war will soon have ceased to exist.

Obituary.

During the year under review the cruel hand of death has snatched away four of our prominent members, namely:—

The Hon'ble Mr. Vengail Raman Nayanar,
Rao Bhahadur J. Dharma Ranga Raju,
and Messrs.

S. Raghunath Rao, and
L. Srinivasa Das.

The late Hon'ble Vengail Raman Nayanar was one of our first vice-presidents, presided at our first general meeting and, was one of our first benefactors. The late Rao Bhahadur Dharma Ranga Raju was vice-president of the union for a number of years and took keen interest in all branches of our work. The late Mr. S. Ragunatha Rao belonged to one of the earliest batches of the Saidapet College and did not live to enjoy his hard earned pension. L. Sreenivasa Das one of our very promising young Licentiates of Coimbatore was taken away at a very premature age.

The union enters this day on the 5th year of its existence and so it is needless now to detail its aims and objects. It is gratifying to note that the four years of its past history have been characterised by a steady progress in its strength and usefulness.

Membership.

Patrons:—According to the rules of the Union, gentlemen who are interested in the welfare of the Union and contribute a sum of not less than Rs. 100 towards its permanent fund are styled Patrons. The committee has great pleasure in announcing that during the year under report the Hon'ble Mr. Mupil Nayar of Kavala-para and the Zemindar of Parlakimidi have joined as patrons and that Messrs. Vengail Krishnan Nayanar and T. N. Veerarayan Tirumalpad (fourth Raja of Nilambur) originally benefactors, have since become Patrons. This is a sure indication that the Union is

beginning to enlist the sympathy of the landed aristocracy of the country and it need hardly be said that this augurs well for its future.

The list of Honorary members of the Union had during the year a valuable addition to its strength in the names of **Dr. L. C. Coleman**, Director of Agriculture, Mysore and **Mr. I. Raman Menon**, Superintendant of Agriculture and Fisheries, Cochin.

The Union acknowledges with thanks the following donations to the permanent fund from our Honorary members; Rs. 20/- from the **Raja of Ettyapuram**, Rs. 25/- from **Raja Vasudeva Raja of Kollengode**, Rs. 10 from **Rai Bahadur M. R. Ry. K. Ranga-chariar Avl.** and Rs. 15 from **M. R. Ry. Dewan Bahadur V. Ramabhadra Naidu**.

During the year under report 7 names were added to the list of first class members and 35 to that of ordinary members. On the whole our strength consists of:—

Patrons	....	....	4.
Honorary Members	....	....	51.
Benefactors	....	....	1.
First Class members	....	....	51.
& Ordinary members	....	....	203.

giving an aggregate of 310 as against 265 of the year previous.

During the year under report Mr. S. L. D'Silva who was a vice-President of the Union, at its inception,

retired from service on the 1st July 1915 after an active and successful career of 31 years.

The Journal.

The conduct of the Journal may perhaps be said to form one of the salient activities of the Union. In accordance with a resolution of the general body meeting held last year the Journal is now appearing as a monthly in place of the quarterly, thus enabling fresh news to be supplied to the subscribers. The repeated unpunctuality of it while being printed at Madras induced the working Committee to change to a local press, firstly, to ensure punctual publication and secondly, to enable speedier and better control of the matter as it passes through the press. The committee wishes to express its appreciation of the willingness and promptness with which the local **Literary Sun Press** has been executing the work entrusted to them.

At present the Journal is not self-supporting because of the low rate at which it is being offered, the subscription being Re. 1/- for twelve monthly issues (of an average of four forms) inclusive of postage but it is soon hoped to place it on a more satisfactory financial basis. The steadily growing popularity of the Journal is patent from the fact that we have this year 490 paying subscribers as against 430 of the previous year. Those who are responsible for the conduct of the Journal are fully conscious of its shortcomings and can but plead that they are unable to devote their whole time to it. We, however, hope that

with the experience gradually being gained, it will steadily improve in future.

College Day and Agricultural Conference.

The 5th College Day and the 4th Agricultural Conference were held on the 18th to 20th July 1914 and were presided over by the Hon'ble **Mr. L. E. Buckley**. A full account of the celebrations and the proceedings has been published in the November issue of our Journal. Our thanks are due to Mrs. M. E. Couchman for kindly giving away the prizes on the sports day. The committee begs to tender its heartfelt thanks to the Hon'ble **Mr. L. E. Buckley** for presiding at both the sessions of the Conference and to Messrs. D. Balakrishnamurthi, Y. Ramachandra Rao, N. Krishna Iyengar, M. R. Ramaswamy Sivan, K. Raghavachary, Gangaraju Pantulu, C. R. Lakshmivaraha Iyengar and Javarayya for kindly contributing papers. We also thank our President **Mr. R. Cecil Wood** and **Mr. Vengail Krishnan Nayanar** for being "At Home" on the College Day. We also acknowledge with many thanks the contributions in money and otherwise we received for our last celebrations from various gentlemen here and elsewhere.

Prize Essays.

Mr. K. Ramasastrulu Naidu once again offered a gold medal for the best essay on an Agricultural Subject. The subject chosen was "Village Economics." Five members

competed. Mr. T. S. Venkatraman offered a gold medal for the best essay on some subject connected with Sugar-cane and four competed. The results of the judging will be announced presently. It is regretted that the medals did not bring in more competitors but it is hoped that with earlier announcement of the subject there will be a larger number next year. The committee's warm thanks are due to the following gentlemen for doing the rather laborious work of judging the essays. Mr. D. T. Chadwick, Dr. C. A. Barber, and Messrs. R. C. Wood, Dewan Bahadur Audinarayanaiah, H. C. Sampson, N. Krishniengar, A. K. Yegnanarayana Aiyar, J. Chelvaranga Raju and M. R. Ramaswami Sivan.

Finance.

The financial statement is printed in the Appendix.

A large amount of success hitherto attained by the Union is due to the kindly care and willing support given to it by the various officers of the Department of Agriculture, especially by our sympathetic Director and our President the Principal.

One of the functions of the Union being to act as a bureau for securing appointments to past students, the reorganisation scheme recently sanctioned and the proposal to send selected Indian subordinates to foreign countries for training are specially welcome.

K. KRISHNAMURTI RAO,
General Secretary.

Permanent Fund Account Corrected up to 6th July 1915.

Receipts.			Expenditure.			
	Up to the Last College Day 1914.	Collections up to date.	Total.		Up to the last College Day 1914.	Up to date
	Rs. A. P.	Rs. A. P.	Rs. A. P.		Rs. A. P.	Rs. A. P.
By donations from honourary members.	370 0 0	70 0 0	440 0 0	Furniture	...	29 0 0
Subscriptions from Patrons	...	350 0 0	350 0 0	Capital	950 0 0	200 0 0
" Benefactors.	200 0 0	100 0 0	100 0 0	Interest on the Capital	87 2 10	81 1 0
" 1st class members.	324 0 0	35 0 0	359 0 0	Journal account	250 0 0	150 0 0
" Ordinary members.	562 0 0	116 0 0	678 0 0	Advance to 1915 College Day	...	200 0 0
Interest on Capital.	87 2 10	81 1 0	168 3 10	Cash on hand	1287 2 10	660 1 0
Total	1543 2 10	552 1 0	2095 3 10	Total	...	...
						2095 3 10

*In deposit at the local Urban Bank.

Journal Account corrected up to 7th July 1915.

Receipts.	Amount.	Expenditure.	Amount.
	Rs. A. P.		Rs. A. P.
From the Permanent Fund this year in addition to Rs. 250/-advanced from the Permanent Fund last year.	250 0 0	Deficit of last year	54 5 8
Subscription by V. P. P.	150 0 0	Advance to the printer	200 0 0
By Money Order	353 9 0	Printing charges	433 2 0
Advertisement charges	100 10 0	Carriage etc.	4 4 0
Interest on amount advanced to the printer.	107 8 0	Establishment	80 6 5
Miscellaneous (typing fees etc.)	6 15 8	Postage (including V. P. P.)	141 1 6
	5 0 0	Stationery	23 4 2
		Lighting charges	3 5 0
		Miscellaneous	12 7 6
		Balance on hand	21 6 5
Total...	973 10 8	Total...	973 10 8

College Day Account for 1914.

Receipts.	Amount.	Expenditure.	Amount.
	Rs. A. P.		Rs. A. P.
Adjusted from Children's treat fund	15 2 6	Last years deficit	61 9 2
Munagala prize Donation	50 0 0	Stationery	10 15 0
Subscription for awarding medals to student amateur actors...		Printing charges	18 12 0
Do. for College day celebrations	28 0 0	Postage stamps	15 2 6
Sale of Rosettes	350 11 0	Telegraph charges	2 6 0
Sale of College day photo	51 0 0	Preparation of ground for sports and cost of flags etc.	27 9 8
Deficit	1 0 0	Badges, ribbons and Rosettes	32 15 3
	4 4 7	Munagala Prize medal	52 1 0
		Medals for amateur actors	24 4 0
		Prizes and medals to winners in sports	145 8 0
		Photoes and framing charges	11 7 0
		Students' entertainments	42 10 6
		Refreshment	50 1 0
		Miscellaneous	4 13 0
Total...	500 2 1	Total...	500 2 1

Audited and found correct.

(Sd.) C. TADULINGA MUDALIAR,

(Sd.) P. A. RAGHUNATHASWAMI AYYANGAR.

Treasurer.

APPENDIX B.

Members of The Madras Agricultural Students' Union.

Corrected up to 5th July 1915.

With Donations to the Permanent Fund.

Honorary Members.

	Rs.
1. Abraham Panditar, M. Rao Sahib.	50
2. Annaswami Thevar, A. Rao Bahadur.	15
3. Anstead, R. D., B. Sc.	
4. Adinarayaniah, M., Dewan Bahadur.	
5. Barber, C. A., M. A., 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. Coleman, L. C., Ph. D.	20
11. Ettiapuram, Rajah of	25
12. Couchman, M. E., I. C. S.	10
13. Fletcher, T. Bainbigge, F. E. S., F. Z. S. R. N.	15
14. Gangarazu Pantulu, M.	
15. Harrison, W. H., M. Sc.	
16. Hilson, G. R., B. Sc.	25
17. Kalinga Rayar, R.	25
18. Kasimkotta, Zamindar of	
19. Keess, W., M. A., M. R. A. C.	
20. Kenny, John	
21. Krishnaswami Ayyengar, N., B. A., B. L., Rao Bahadur.	
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.	
30. Pattabirama Rao, N., B. A.	
31. Ramabadra Naidu, V., Hon'ble Dewan Bahadur	15
32. Raman Menon, I.	
33. Raman Unni Valia Nayar, Rao Sahib.	30
34. Ramasastrulu Naidu, K. R., B. Sc.	
35. Rangachariar, K., M. A., L. T.	10
36. Robertson, F. W. R., I. C. S.	
37. Sampson, H. C., B. Sc.	
38. Seenam Bhat, J. Rao Sahib.	
39. Shepperson, C. W. J., B. Sc.	
40. Shanmugam Pillai, S. T.	
41. Southern, H., B. A.	
42. Sreenivasam Pillai, K. S., Rao Bahadur.	15
43. Stuart, G. A. D., I. C. S.	
44. Subba Rao, N.	
45. Subramania Ayyar, Sir. S., B. L., K. C. I. E. Dewan Bahadur	50
46. Subraya Aiyar, P., B. A.	
47. Swamikannu Pillai, L. D., M. A., B. L., (Madras) LL. B. (London) Hon'ble.	
48. Thomas Roger, B. Sc.	
49. Vasudeva Rajah Valia Nambidi, Rajah.	25
50. Venkatachari, C.	
51. Wood, R. C., M. A.	
52. Yegyanarayana Ayyar, A. K., M. A., (Madras and Cantab).	5

Patrons.

1. The Hon'ble Mr. Moopil Nayar, Kavalapara.	100
2. Zamindar of Parlakimidi.	100
3. Veerarayan Thirumalpad.	100
4. Vengail Krishnan Nayanar.	50

Benefactors.

1. Kochu Kunjunni Achan, P., L. Ag.	50
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First Class Members Subscription Rs. 10.

1. Alwa, K. T., L. Ag.
2. Ananda Rao, D., B. Sc.
3. Appa Rao Pantulu, D.
4. Bania, V. M., D. A.
5. Chelvaranga Raju, J.
6. Deviah, K. C.
7. D'Silva, S. L.
8. Eapen George, M., L. Ag.
9. Kochu Govinda Marar.
10. Gurunatha Pillai, V. S.
11. Hyvadana Rao, K. R.
12. Iswaran Pillai, I. C.
13. Mahamad Abdur Rahim, P. N.
14. Muthayya, M., L. Ag.
15. Narayana Rao, D. L.
16. Panchapakesa Ayyar, M., D. A.
17. Parameswara Ayyar, M., D. A.
18. Patuck, N. H.
19. Ranga Raju, J. R.
20. Rama Rao, A., Rao Sahib.
21. Ramaswami Ayyar, R., D. A.
22. Ramaswami Ayyar, T. S., L. Ag.
23. Ramaswami Sivan, M. R., B. A., D. A.
24. Ranganath, T. R., L. Ag.
25. Ranga Reddy, C.
26. Ratnaji Rao, V., L. Ag.
27. Sankara Ayyar, M. S.
28. Sankunni Menon, K. P., L. Ag.
29. Siva Rao Badami, L. Ag.
30. Srinivasa Rao, H.
31. Subramania Mudaliar, V. P., G. B. V. C.
32. Sundaresa Ayyar, M.
33. Tadulinga Mudaliar, C.
34. Venkat Rao, Badami, L. Ag.
35. Vysarajan, C. P., L. Ag.

Students. Class III.

36. Subba Rao, K.

Class II.

37. Amed Hussain.
38. Nilakanta Ayyar, A. S.
39. Rangaswami Iyengar, E. N.
40. Seetarama Ayyar, K.
41. Srinivasan, N.
42. Venkatachalla Mudaliar, M.

Class I.

43. Avadai Nayakam Pillai, K.
44. Kondayya Sarma, A.
45. Krishnamoorthy Ayyar, V.
46. Krishnasawamy Ayyar, A. V.
47. Muthuswami Ayyar, T. G.
48. Onkaran, P. J.
49. Ramaswami Reddy, R.
50. Rao Satyanarayana.
51. Sankara Ayyar, S. A.

Ordinary Members Subscription Rs. 5.

1. Anantarama Sastry, S.
2. Audinarayana Chetti, B.
3. Azizudeen Sahib, Mahamad, D. A.
4. Bubu Rao, S., D. A.
5. Balakrishna Murthi, D., D. A.
6. Bhaskara Ayyar, C.
7. Bhandary, K. T., L. Ag.
8. Budhavidaya Rao, T., L. Ag.
9. Chandrasekara Mudaliar, A. R.
10. Cherian Jacob, K., L. Ag.
11. Chinnathambi Pillai, A., L. Ag.
12. Daniell, S., L. Ag.
13. Dhanakoti Razu, V. G., D. A.
14. Dwarakanath, B., L. Ag.
15. Ellappa Chetti, C., L. Ag.
16. Ganapathysundaram, T. S.
17. George, M. C., L. Ag.

18. Gopalswami Mudaliar, S.
19. Gopalakrishna Razu, L. Ag.
20. Govinda Kidavu, M., D. A.
21. Gururaja Rao, K. M., L. Ag.
22. Javarayya, G., D. A.
23. Jeevan Rao, P. S., B. A.
24. Jogi Raju, G., D. A.
25. John, W. J.
26. Kamakshi Rao, G.
27. Kesava Pillai, N., L. Ag.
28. Krishna Ayyar, D., L. Ag.
29. Krishna Ayyar, T. A., L. Ag.
30. Kolandaiswami Pillai, N. S., D. A.
31. Krishnamurthi Rao, K., D. A.
32. Krishnan, P. G., D. A.
33. Krishnaswami Ayyar, K. V.
34. Kumbamboo Nambiar, M., L. Ag.
35. Lakshman Rao, T., B. A.
36. Lakshman Rao, T. S., D. A.
37. Madhava Rao, B.
38. Madiah, C. S., L. Ag.
39. Mal Rajagopal, G. L. Ag.
40. Manicka Mudaliar, V., L. Ag.
41. Mangesh Rao, M., D. A.
42. Manga Razu, L. Ag.,
43. Muthuswami Ayyar, V., D. A.
44. Nath, B. V., F. C. S.
45. Narayana Ayyar, C., D. A.
46. Narayana Ayyengar, K., D. A.
47. Natesa Ayyar, L. S., D. A.
48. Narasinga Raju, C., L. Ag.
49. Narayana Ayyar, K., L. Ag.
50. Narayaniah, S., L. Ag.
51. Narayana Rao, B. V., D. A.
52. Narayana Rao, T. V., D. A.
53. Narayanaswami Ayyar, V. S., D. A.
54. Panakal Rao, D., L. Ag.
55. Parthasarathy, B. K.
56. Paramanandam, T., L. Ag.

57. Pranatharthiharan, L. Ag.
58. Pundit, R. P.
59. Raghavachari, W., D. A.
60. Raghava Ayyengar, S., D. A.
61. Raghavachari, K., L. Ag.,
62. Raghunathaswami Ayyengar, P. A., D. A.
63. Rajagopalachari, T. V., D. A.
64. Rajagopal Naidu, G.
65. Ramachendra Rao, Y., M. A.
66. Ramiah, K. L. Ag.
67. Ramalinga Vadiar, C. S., B. A., D. A.
68. Ramanatha Ayyar,
69. Ramaswami Pillai, S., D. A.
70. Ramanujachari, K., L. Ag.
71. Raghavendra Rao, P. V., D. A.
72. Rangaswami Ayyengar, G. N., B. A.
73. Saldana Isidore.
74. Sambasiva Ayyar, T. S.
75. Sankara Ayyar, K., D. A.
76. Sankaranarayana Ayyar, K.
77. Sankaranarayanan, K. R.
78. Sankarakumar, L., L. Ag.
79. Sankaran Nair, Kunhi, L. Ag.
80. Sadagopa Ayyengar, N., L. Ag.
81. Seshachari, C. V., L. Ag.
82. Seturama Ayyar, A., D. A., Rao Sahib.
83. Sitarampathurudu, L. Ag.
84. Sivaramakrishna Ayyar, N., L. Ag.
85. Sivarama Rao, D. B., L. Ag.
86. Siva Rao Bhairya, L. Ag.
87. Sitaram Chetti, M., L. Ag.
88. Srikantiah, S. V.
89. Srinivasachari, N. R.
90. Srinivasacharlu, T. V.
91. Sriramulu Pantulu, R.
92. Sriramulu, K.
93. Subba Ayyar, S., D. A.
94. Subramania Ayyar, C. S.
95. Subramania Ayyar, A. K., L. M. E.

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96. Subramania Ayyar, R.
97. Subramania Ayyar, P. S., L. Ag.
98. Subramania Ayyar, S., D. A.
99. Subramania Ayyar, T. V.
100. Subramania Kandar, P.
101. Subramania Sastri, V. S., D. A.
102. Sundara Ayyar, K. P., L. Ag.
103. Sundararama Ayyar, K.
104. Sundararama Ayyar, S., M. A.
105. Tilloo, K. B., D. A.
106. Thirumuruganatham Pillai, A. V., D. A.
107. Unnikrishna Menon, K., D. A.
108. Vaidhinatha Ayyar K.
109. Veeraraghava Rao, L. Ag.
110. Veeraswami, B., L. Ag.
111. Venkaswami Rao, T. R., D. A.
112. Vellodi, M. U., L. Ag.
113. Venkatrama Ayyar, D. K.
114. Venkatrama Ayyar, P. S.
115. Venkatraman, T. S., D. A.
116. Venkatraman, T. S., B. A.
117. Venkatakrishna Mudaliar, S. R., B. A.
118. Venkatramiah, R.
119. Venkuswami Ayyar, P. S., L. Ag.,
120. Vijayaraghavachari, V.
121. Viswanatha Ayyar, N. V., L. Ag.
122. Vital Rao, U., L. Ag.
123. Yesudasan, L. Ag.,

Students. Class III.

124. Adhinarayana Rao, K.
125. Balakrishna Ayyar, M. A.
126. Dhuraswami Ayyangar, G.
127. Gopalakrishna Ayya, A.
128. Gopala Nair, A.
129. Jacob, K. M.
130. Jivan Das, B.
131. Kunhappa Nambiar.
132. Narasimha Chari, L.

133. Ramanatha Ayyar, V.
134. Sanjiva Rao, Kalli, N.
135. Sankaran Pillai, K. S.
136. Sinappa Tolar, B.
137. Srinivasan, C. R.
138. Swami Rao, R.
139. Vrudhajalam Pillai, U.

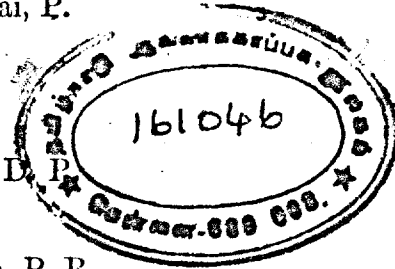
Class II.

140. Achutan Nambiar, K.
141. Anantara Ayyar, T. G.
142. Arulanandam Pillai, C.
143. Chakrapani Marar, K. W.
144. Dharmalinga Mudaliar, S.
145. Gunesa Ayyar, A. K.
146. Gopalakrishna Paul, M.
147. Govindan Nambiar, K.
148. Govinda Poi, K.
149. Krishnaswami Pillai, K.
150. Kunnikutti, M. P.
151. Kuppuswami Aiyangar, S.
152. Kuriyan, P. K.
153. Lakshmipathi Rao, T.
154. Paramanayagam Asari, K. S.
155. Rajagopala Ayyar, T. K.
156. Ramachandra Ayyar, V.
157. Ramalinga Ayyar, A.
158. Ramaswami Ayyar, V.
159. Rangaswami Ayyengur, T. A.
160. Rangaswami Pillai, K.
161. Sankunni Menon, K.
162. Sitarama Sastri, G.
163. Shokalingam Pillai, R.
164. Subramania Ayyar, S.
165. Suryanarayana Sankarapalli.
166. Vedantam Ayyengar, G.
167. Venkoba Achar, A.
168. Venugopala Ayya, U. V.

169. Viravaratha Raju, S.

Class I.

170. Abhisekanathan Pillai, P.
 171. Ananthan, M.
 172. Appaya, C. B.
 173. Balaji Rao, K.
 174. Bhima Rao, K. V.
 175. Challam Ayyengar, D. P.
 176. Chinnaswami M.
 177. Fernando, S. P.
 178. Gopalakrishna Ayya, P. R.
 179. Gowrisankara Ayyar, M. P.
 180. Hanumantha Rao, P. V.
 181. Hanumanulu, S.
 182. Kannappa Pillai, P.
 183. Kesavanunni Nambiar, P.
 184. Krishna Avathaniel, A. K.
 185. Krishna Rao, Naidu, M.
 186. Kutti Krishna Menon, M.
 187. Mungasha Rao, B.
 188. Maria Susai.
 189. Moses, A.
 190. Narayana Ayyar, L. K.
 191. Nellaikumar Pillai, P.
 192. Ramachendra Ayyar, A.
 193. Ramanna Rai, K. S.
 194. Ramaswami Ayyar, A.
 195. Samuel Nallathambi.
 196. Sankara Ayyar, S.
 197. Srinivasa Ayyengar, S. R.
 198. Subbannachar, V.
 199. Sundaram Ayyar, C. V.
 200. Vaidhinatha Ayyar, M.
 201. Vasudeva Shenoi, K.
 202. Venkatanarasimham, S.
 203. Venkatesa Ayyar, C. K.



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